

3 AFFECTED ENVIRONMENT

This chapter describes the regional and local environmental characteristics at the proposed National Enrichment Facility (NEF) site. These data and information provide a starting point from which to assess impacts (Chapter 4) of the proposed action (Chapter 2) of this Draft Environmental Impact Statement (Draft EIS). This chapter presents information on land use; water resources; historic and cultural resources; visual and scenic resources; climatology, meteorology, and air quality; geology, minerals and soils; ecology; noise; socioeconomic; public health; transportation; and waste disposal.

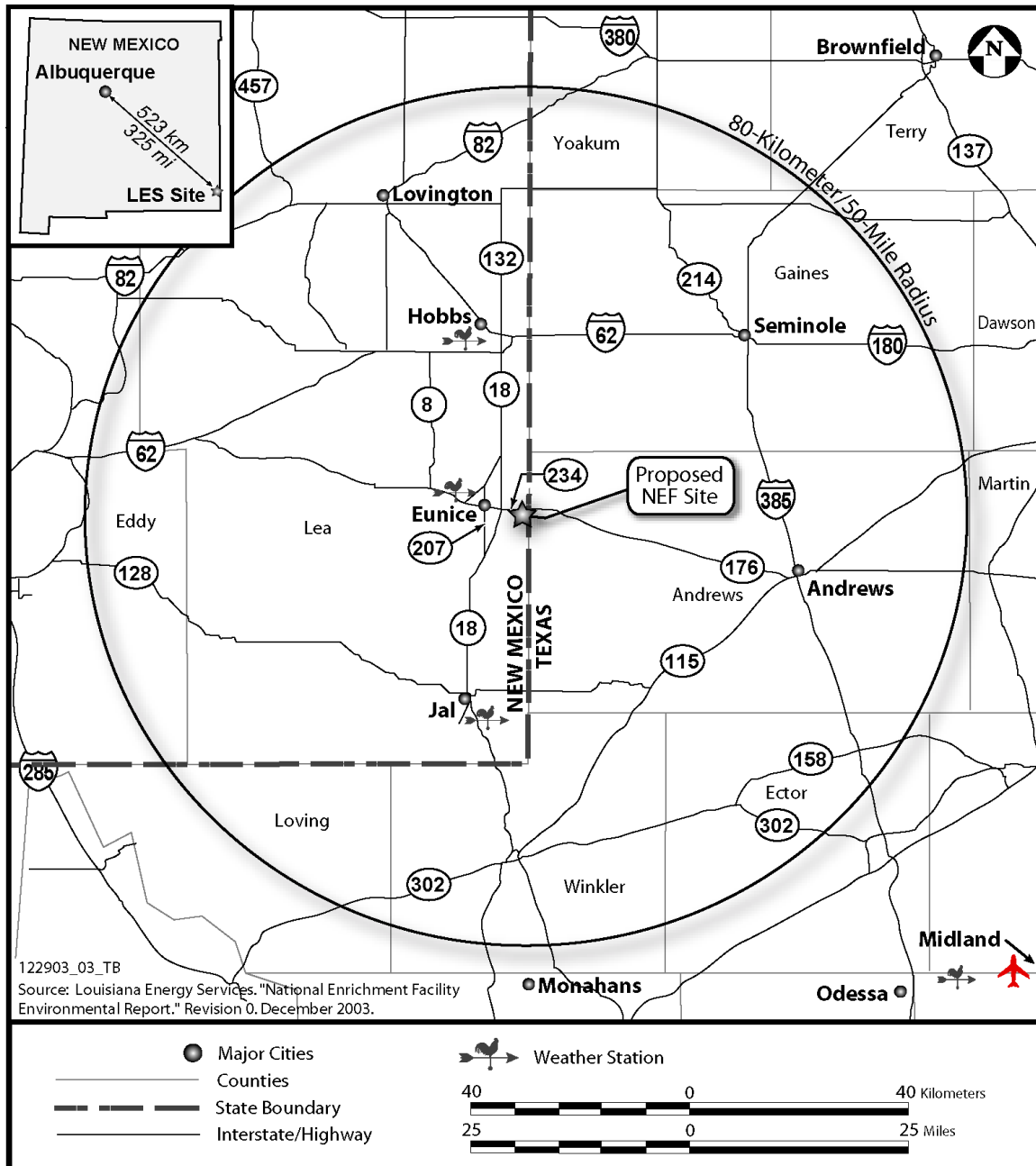


Figure 3-1 Proposed NEF Site and Surrounding Areas (LES, 2004a)

3.1 Site Location and Description

The proposed NEF site is located in southeastern New Mexico in Lea County, approximately 32 kilometers (20 miles) south of Hobbs, New Mexico; 8 kilometers (5 miles) east of Eunice, New Mexico; and about 0.8 kilometers (0.5 miles) from the New Mexico/Texas State line (Figure 3-1). Eunice, the closest population center, is located at the cross-junction of New Mexico Highways 207 and 234. The site is about 51 kilometers (32 miles) northwest of Andrews, Texas, and 523 kilometers (325 miles) southeast of Albuquerque, New Mexico. The largest population center with an international airport is Midland-Odessa, located 103 kilometers (64 miles) southeast of the proposed site.

The State of New Mexico currently owns the proposed site property; however, Louisiana Energy Services (LES) has been granted a 35-year easement (LES, 2004a; LES, 2004b). The land-exchange process for the 220-hectare (543-acre) proposed site would eventually culminate in the land being deeded to LES (LES, 2004a; LES, 2004b; LES, 2004c).

The site consists of mostly undeveloped land that is used for cattle grazing. A gravel-covered road bisects the east and west halves of the site. The site is traversed by an underground carbon dioxide pipeline, running southeast-northwest. An underground natural gas pipeline is located along the southern property line (Figure 3-2). A barbed-wire fence runs along the eastern, southern, and western property lines. The north fence has been dismantled.

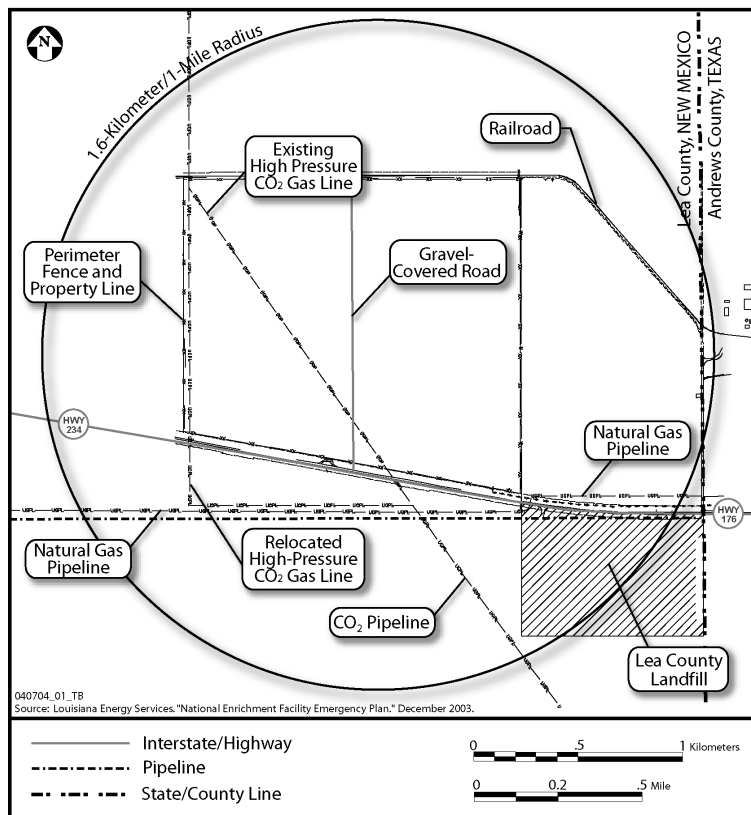


Figure 3-2 Proposed NEF Site Area (LES, 2004b)

3.2 Land Use

This section includes a description of the land uses on and near the proposed NEF site as well as a discussion of offsite areas and the regional setting. Figure 3-3 shows a general land use map for the proposed site vicinity.

The area surrounding the proposed site consists of vacant land and industrial developments. The northern side of the site is bordered by a railroad spur, beyond which is a sand/aggregate quarry operated by Wallach Concrete, Inc. (Wallach, 2004) and an oil-reclamation operation owned by Sundance Services, Inc. The Sundance facility disposes of oil industry solid wastes in a disposal facility and treats soils contaminated with hydrocarbons via landfarming (NMCDE, 2004a; Sundance, 2004a; BLM, 1992).

Further east of the proposed site, a hazardous waste treatment facility operated by Waste Control Specialists (WCS) is situated within the State of Texas. The WCS facility owns buffer areas that border

the immediate eastern boundary of the proposed NEF site. The WCS facility holds a renewable seven-year license to temporarily store low-level radioactive and mixed wastes. In addition, WCS holds:

- A *Resource Conservation and Recovery Act* (RCRA) Part B permit (Texas Natural Resources and Conservation Commission Permit No. HW-50358).
- A *Toxic Substances Control Act* Land Disposal Authorization (Environmental Protection Agency [EPA] Identification No. TXD988088464).
- A Texas Natural Resources and Conservation Commission Naturally Occurring Radioactive Material Disposal Authorization, and a Texas Department of Health, Bureau of Radiation Control, Radioactive Material License (Texas Department of Health License No. L04971) (WCS, 2004a; TDH, 2000).

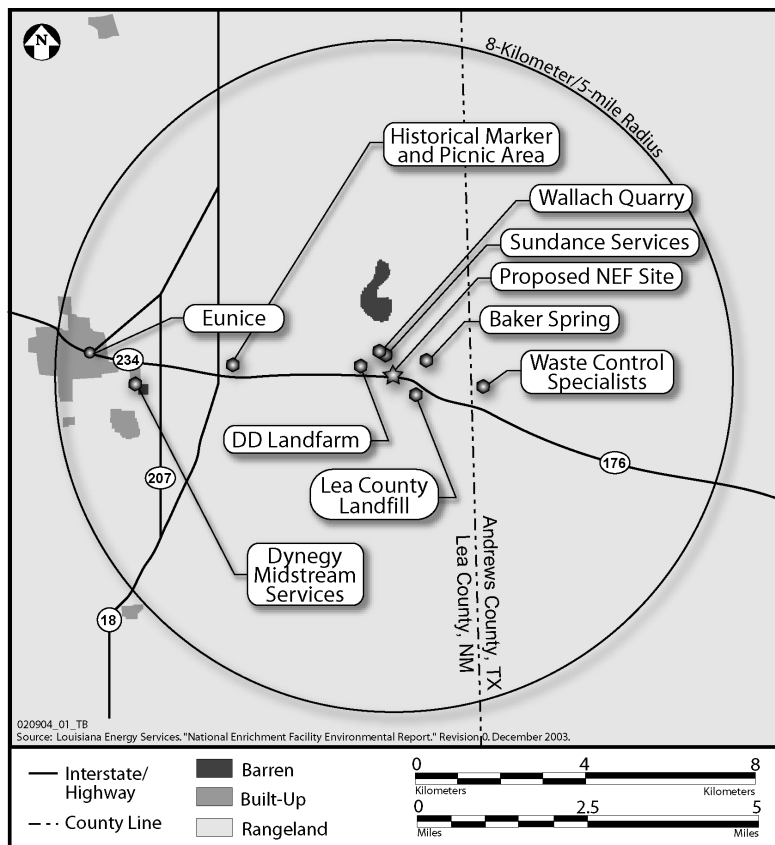


Figure 3-3 Land Use Within 8 Kilometers (5 Miles) of the Proposed NEF Site (LES, 2004a)

Under these licenses, permits, and authorizations, WCS treats, processes, and/or temporarily stores low-level radioactive wastes (including greater-than-class-C, sealed sources, solids, and liquids), 11e(2) material, and mixed wastes (i.e., hazardous waste with radioactive contamination) in addition to the disposal of RCRA/*Toxic Substances Control Act* hazardous materials (WCS, 2004b). WCS is an Agreement State licensee with the State of Texas and has a U.S. Nuclear Regulatory (NRC) Order for exemption from 10 CFR Part 70 (NRC, 2001).

The Lea County landfill is located to the southeast and across New Mexico Highway 234 from the proposed NEF. This landfill disposes of municipal solid waste for the Lea County Solid Waste Authority under New Mexico Environment Department Permit Number SWM-130302. The landfill services Lea County and its municipalities, and other communities within a 160-kilometer (100-mile) radius (LCSWA, 2004).

Bordering the proposed site from the west is privately held land, beyond which is the DD Landfarm, a petroleum-contaminated-soil treatment facility (NMEMNRD, 2000). A historical marker and picnic area are also situated approximately 3.2 kilometers (2 miles) west of the proposed NEF at the intersection of New Mexico Highway 18 and Highway 234. Also, Dynegy Midstream Services, a gathering and processing plant of natural gas, is located 6 kilometers (4 miles) west of the proposed NEF site. The nearest residences are situated approximately 4.3 kilometers (2.6 miles) west of the site (LES, 2004a).

The oil and gas industry has developed the land further to the north, south, and west of the proposed site with hundreds of operating oil pump jacks and associated rigs (Figure 3-4). The more than 33,700 oil wells in the southeastern region of New Mexico produced approximately 63.4 million barrels of oil and more than 16 million cubic meters (570 million cubic feet) of gas in 2003 (NMCDE, 2004b; NMEMNRD, 2004).

As shown in Figure 3-3, the area surrounding the proposed NEF is extensively dominated by open rangeland used for cattle grazing. Over 98 percent of the land within the 8-kilometer (5-mile) radius of the proposed NEF site is comprised of herbaceous rangeland, shrub and brush rangeland, and mixed rangeland. Rangeland encompasses 12,714 hectares (31,415 acres) within Lea County, New Mexico, and 7,213 hectares (17,823 acres) within Andrews County, Texas (USGS, 1986).

Throughout the year, cattle grazing occurs on adjacent local lands including those owned by Wallach Concrete, Inc., and WCS (Wallach, 2004; Berry, 2004).



Figure 3-4 Oil Pump Jack

Built-up land and barren land constitute the other two land use classifications in the proposed site vicinity, but at considerably smaller percentages. Built-up land (i.e., land with residential and industrial developments) comprises approximately 243 hectares (601 acres) of Lea and Andrews Counties and makes up 1.2 percent of the land use. Barren land, consisting of bare exposed rock and transitional and sandy areas, make up the remaining 0.3 percent of land area. There are no special land use classifications (i.e., Indian tribe reservations, national parks, or prime farmland) within the proposed site vicinity. Also, there are no known public recreational areas located within 8 kilometers (5 miles) of the site. With the exception of cattle grazing, no agricultural activities have been identified in the proposed site vicinity (LES, 2004a). Cattle are the primary livestock for both Lea and Andrew Counties (USDA, 1998; USDA, 1999). The nearest dairy farms in Lea County (where milk cows make up a significant number of cattle) are located near the city of Hobbs (Wallach, 2004). There are no milk cows in Andrews County (LES, 2004a).

The following nonindustrial water resources are located in the proposed NEF site vicinity:

- A manmade pond on the adjacent quarry property to the north that is stocked with fish for private catch-and-release use (Wallach, 2004).
- Baker Spring, an intermittent surface-water feature situated about 1.6 kilometers (1 miles) northeast of the site that contains water seasonally.
- Several cattle-watering holes where ground water is pumped by windmill and stored in aboveground tanks.
- A well by an abandoned home about 4 kilometers (2.5 miles) to the west.

- Monument Draw, a natural shallow drainageway situated several kilometers (miles) southwest of the site. Local residents indicated that Monument Draw only contains water for a short period of time following a significant rainstorm (LES, 2004a).

Industrial water uses include “produced water” lagoons, a freshwater pond, evaporation ponds, and a settlement basin. The freshwater pond, a settlement basin, and several evaporation ponds are located on the adjacent quarry property to the north (Wallach, 2004). Five produced-water lagoons and an oil-reclamation pit are located on the Sundance Services, Inc., property (Sundance, 2004b). Produced water is salty wastewater that is brought to the surface during production of natural gas and is also a byproduct of the cleaning process of raw crude oil from a well head (ANL, 2004; Emerson, 2003).

In addition, three Superfund/*Comprehensive Environmental Response, Compensation, and Liability Act* sites are located in Lea County, and six are located in Eddy County, New Mexico (EPA, 2003c). These sites are not in close proximity to the proposed NEF site. There are no sites in Andrews County (EPA, 2003c).

Currently, other than the construction of the proposed NEF and the potential siting of a low-level radioactive waste disposal site at WCS, there are no other known future or proposed land use plans in the area. In addition, the proposed site is not subject to local or county zoning, land use planning, or associated review process requirements, and there are no known potential conflicts of land use plans, policies, or controls (LES, 2004a). However, the city of Eunice is working on a new zoning plan for expansion of the city limits (Consensus Planning, 2004). The city plan includes an eastward commercial and heavy industrial zoning area that follows New Mexico Highway 234 towards the proposed NEF site. Figure 3-5 presents details of the preferred land use for the city of Eunice.

3.3 Historic and Cultural Resources

The region surrounding the proposed NEF site in southeastern New Mexico and western Texas is rich in prehistoric and historic American Indian and Euro-American history. However, the environmental setting in the immediate vicinity of the proposed site has greatly affected both prehistoric and historic occupation and use of the area. This local setting, which occurs well onto the Llano Estacado (see Section 3.6, “Geology, Minerals, and Soils”), is a flat, treeless plain lacking nearby permanent or semipermanent surface water. As a result, it has not been conducive to extensive human use of the area over the centuries. In contrast, both prehistoric and historic occupation and use were extensive in all directions from the proposed site. Shelter and resources were more readily available in the site area at selected locales on the Llano Estacado where temporary and some permanent springs and lakes were found.

The cultural sequence in the region extends back approximately 11,000 years, and several chronological prehistoric and historic periods can be defined (Sebastian and Larralde, 1989). These periods include the Paleo-Indian period (9000 B.C.-7000 B.C.); the Archaic period (5000-6000 B.C.–A.D. 900-1000); the Ceramic period (A.D. 900-1500); the Protohistoric Native American and Spanish Colonial period (A.D. 1541-1800); and the Historic Hispanic, American Indian, and American period (A.D. 1800-present). The following subsections present brief background summaries of these eras.

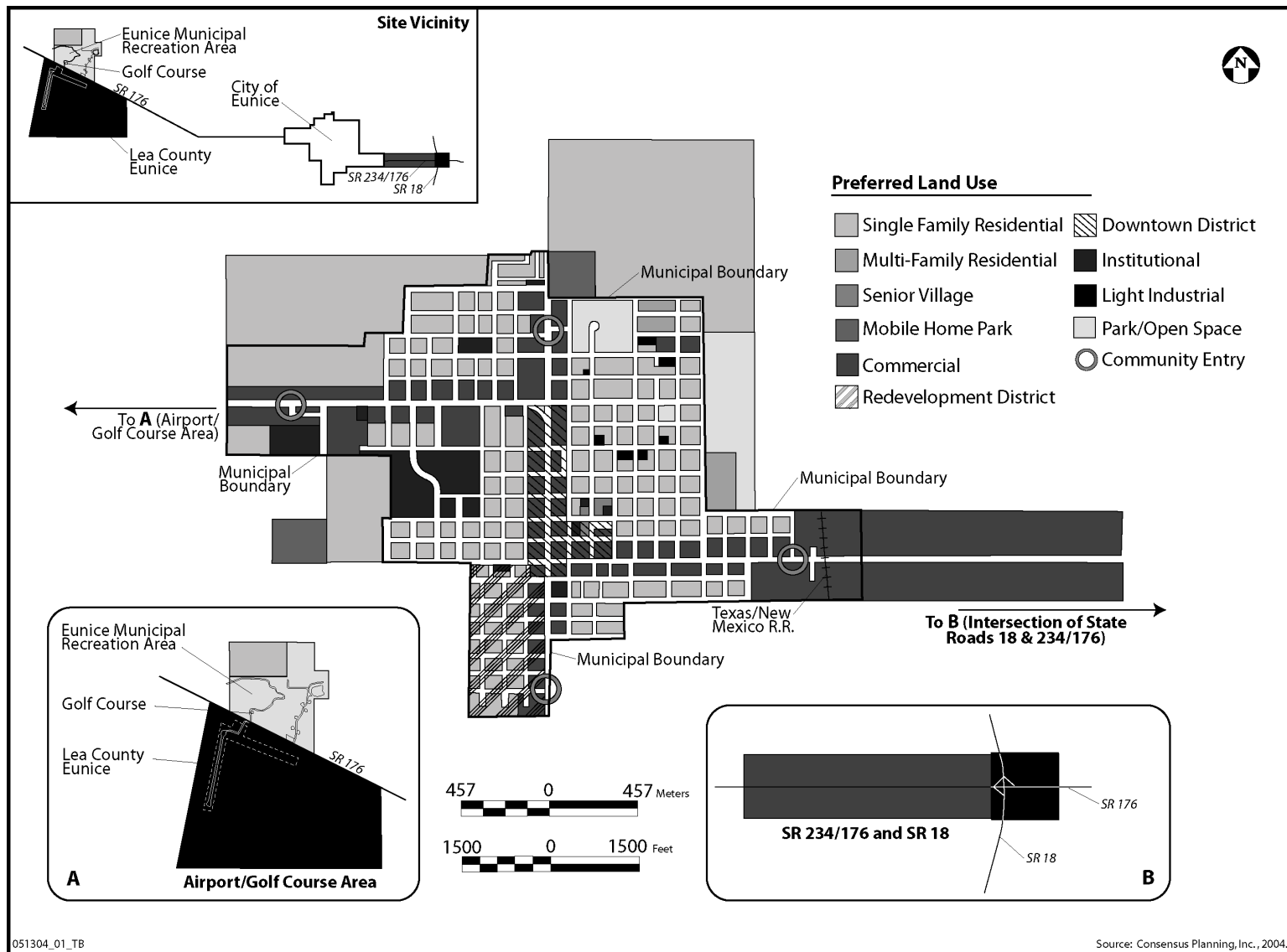


Figure 3-5 Preferred Land Use for the City of Eunice, New Mexico (Consensus Planning, 2004)

3.3.1 Prehistoric

According to the cultural resource overview for southeastern New Mexico (Sebastian and Larralde, 1989), the initial prehistoric period in the region was characterized by a big-game-hunting subsistence pattern with small groups of nomadic humans preying on now extinct animal species such as mammoths and large bison. Some of the classic Paleo-Indian archaeological hunting sites were discovered on the Llano Estacado and nearby areas, although none are located in close proximity to the project area. The subsequent Archaic period was also marked by nomadic groups relying on increased use of smaller game animals and plant foods. In general, the Ceramic period was characterized by a trend towards more sedentary villages and reliance on cultivated crops. However, the environment in the vicinity of the project area was not conducive to this lifestyle, and the presence of Ceramic period sites reflects more limited occupations than other areas such as the Pecos River Valley to the west. Reviews of existing archaeological site files (Sebastian and Larralde, 1989) and area overviews (Leslie, 1979; Runyon, 2000) reveal that archaeological materials associated with each of these prehistoric periods have been found in the vicinity of the project area. All previously recorded archaeological sites close to the proposed NEF site are designated as seasonally used temporary prehistoric campsites.

3.3.2 Protohistoric and Historic Indian Tribes

Similar to the prehistoric era, protohistoric and historic period exploitation of the immediate vicinity of the NEF project area by Indian tribes was also sparse, although occupation and use of the larger region was intensive. At the time of contact by Spanish expeditions, the area was occupied by groups that are nearly nonexistent today. These groups include the Suma and Tigua (Gerald, 1974) and the Jumano (Kelley, 1986; Hickerson, 1994), who were centered to the south in western present-day Texas and to the west along the Pecos River drainage. These groups were replaced in historic times by Plains immigrants from the north and east, including the Kiowa (Mayhall, 1971), Comanche (Fehrenbach, 1974; Kavanagh, 1996; Wallace and Hoebel, 1952), and the Mescalero Apaches who occupied the mountainous areas of south-central New Mexico (Opler, 1983; Sonnichsen, 1973). Each of these protohistoric- and historic-period groups frequented the vicinity of the project area over time, but their primary occupations and activities took place elsewhere in areas with better resources.

Based on various testimonies before the U.S. Indian Claims Commission (ICC), the area proximal to the project area was found to have been used and/or occupied by Federally recognized present-day tribes known as the Plains Apache, Comanche, and Kiowa. Today, these tribes occupy a reservation in southwestern Oklahoma (ICC, 1979). The ICC also noted that the historically occupied area of the Mescalero Apache tribe lies just to the west of the project area, although Mescalero did at times extend over an area that includes the proposed NEF site. Today, the Mescalero Reservation is located about 125 miles northwest of the project area. A remnant group of the Tigua (Ysleta del Sur Pueblo near El Paso, Texas) also has a traditional use presence in the area. Based on these data, the NRC staff consulted the following modern-day tribes:

- Apache tribe of Oklahoma.
- Comanche tribe of Oklahoma.
- Kiowa tribe of Oklahoma.
- Mescalero Apache tribe.
- Ysleta del Sur Pueblo.

Review of the extant literature has not identified any known individual tribal properties and resources or traditional cultural places of significance within or near the proposed NEF site.

3.3.3 Historic Euro-American

The historic Euro-American period in the region began with Spanish exploration expeditions, beginning in 1541 with the Coronado expedition. However, no information was available that indicates any of the Spanish expeditions approached the project area (Morris, 1997). The first Anglo presence in the vicinity of the proposed NEF site was associated with U.S. military activities involved in conflicts with and the subjugation of the Indian tribes. Treaties in the 1860's and 1870's essentially ended the American Indian presence in the area as the various tribes were relocated to reservations. Following these events, American settlers slowly but steadily occupied the area in the vicinity of the proposed NEF site. This era leading to the present day was characterized by several phases of occupation and use. These phases included the open-cattle-ranching era (from the 1860's to about 1910), homesteading and settlement (beginning about 1905), and the development of the oil and gas industry (beginning in the 1920's). These events are summarized in the following county histories: Andrews County, Texas (organized in 1910) (ACHC, 1978); Gaines County, Texas (organized in 1905) (Coward, 1974); and Lea County, New Mexico (organized in 1917) (Brooks, 1993; Hinshaw, 1976; Mauldin, 1997; Mosely, 1973), on which sources the following discussion is based as it pertains to the proposed NEF site.

The 84 Ranch (also known as the Half Circle 84) was one of the earliest ranches in the area. The 84 Ranch was established in 1884 or 1885 with the digging of a well and the emplacement of a windmill (Hinshaw, 1976; Price, 1967). The well and ranch headquarters were located east of the present-day town of Eunice, about 4.8 kilometers (3 miles) northwest of the project area. The proposed NEF site was originally included in the ranch's grazing lands. The 84 Ranch was eventually purchased by the larger JAL Ranch, which raised about 40,000 head of cattle on an expansive tract of land that occupied the southeast quarter of Lea County until about 1910.

After 1900, changes in the *Homestead Act* allowed larger acreages that permitted settlers to take up tracts of the former open range. In 1908, John Carson homesteaded 129 hectares (320 acres) of former 84 Ranch land, a tract that would eventually become the city of Eunice. The Carson homestead was located about 8 kilometers (5 miles) west of the proposed NEF site. In 1909, Carson established a post office and general store at the locale named for his eldest daughter, Eunice. Other settlers were attracted to the location, and Eunice reached its pinnacle as a pioneer settlement in the years 1914-1915. However, drought and other larger events—including recession, World War I, and the influenza epidemic of 1918—led to a decline in the area's population. A regional oil boom reached Eunice in 1929, and the town began to again grow. In 1937, Eunice was incorporated as a city with a population of 2,188.

3.3.4 Historic and Archaeological Resources at the Proposed NEF Site

The State of New Mexico currently owns the proposed NEF site, which comprises 220 hectares (543 acres) of land lying north of U.S. Highway 176 in Section 32 of range 38E in Township 21S. Information obtained from the Historic Preservation Division of the New Mexico Office of Cultural Affairs, Archaeological Resource Management Records Section, reveals that prior to the current project, no cultural resources surveys have been conducted within the proposed project area nor were there any previously recorded archaeological sites. A review of the current listings for the New Mexico State Register of Cultural Resource Properties and the National Register of Historic Places indicate no listed properties within 8 kilometers (5 miles) of the project area.

In September 2003, an intensive cultural resources inventory was completed for the 220-hectare (543-acre) tract, resulting in the identification and recording of 7 new archaeological sites and 35 instances of isolated artifacts (Graves, 2004). The latter included isolated occurrences of prehistoric artifacts, except

for two U.S. General Land Office bench markers dated 1911 located at the northeast and northwest corners of the section, and parts of an historic barbed-wire fence enclosure.

Each of the seven archaeological sites recorded within the proposed project area is designated as a prehistoric campsite of indeterminate age. In the New Mexico site file system, the archaeological sites are listed as Laboratory of Anthropology 140701-140707. All of the sites are similar in configuration, with a presence of one or more thermal features (concentrations of fire-cracked rocks), scattered fire-cracked rocks, and a scatter of stone tools and/or flakes. Field analysis of the artifacts indicates that these campsites and artifact scatters may have been associated with procurement of stone tool materials from nearby gravel cobbles.

Applying the significance criteria for possible listing in the National Register of Historic Places, the field investigators recommended to the New Mexico State Historic Preservation Office that each of the recorded archaeological sites falls into one of the following categories:

- **Not eligible** for listing in the National Register of Historic Places based on lack of buried cultural materials (field recording has exhausted the research potential) (Laboratory of Anthropology 140701, 140702, and 140703).
- **Potentially eligible** for listing in the National Register of Historic Places based on an observed potential for buried cultural deposits (Laboratory of Anthropology 140707).
- **Eligible** for listing in the National Register of Historic Places based on the expectation that buried cultural deposits exist and/or the surface data indicate a definite research potential (Laboratory of Anthropology 140404, 140705, and 140706).

Each of the recommendations for potential eligibility or eligible status for the NEF archaeological sites falls under the National Register of Historic Places criterion (d), which identifies sites that have either yielded, or may likely yield, information important in prehistory or history. By designation, cultural items recorded as isolated artifacts are not considered as potentially eligible for listing in the National Register of Historic Places. All seven sites have been determined to be eligible for listing in the National Register of Historic Places .

3.4 Visual and Scenic Resources

The proposed NEF site consists of open, vacant land. Nearby landscapes are similar in appearance, except for manmade structures associated with the neighboring industrial properties and the local oil and gas well heads. Figures 3-6 and 3-7 show that no existing structures are located on the site. The only agricultural activity in the site vicinity is cattle grazing.



Source: Louisiana Energy Services, "National Enrichment Facility Environmental Report," Revision 0, December 2003, 020604_01_TB

Figure 3-6 View of the Proposed NEF Site Looking from the Northwest to the Southeast (LES, 2004a)

The proposed NEF site is considered indistinguishable in terms of scenic attractiveness when compared to surrounding land. No recreational resources are identified in the immediate area of the site.

The proposed NEF site received the lowest scenic-quality rating using the Bureau of Land Management (BLM) visual resource inventory process (LES, 2004a). This rating allows for the greatest level of landscape modification, which is defined as “extensive change to the landscape characteristics which may dominate the view and be the major focus of viewer attention” (BLM, 2003a; BLM, 2003b).

The proposed NEF site is not visible from the city of Eunice, which is located 8 kilometers (5 miles) to the west.

However, the site is bordered to the south by New Mexico Highway 234 and is visible to westbound traffic approaching from the New

Mexico/Texas State line, approximately 0.8 kilometers (0.5 miles) to the east. Eastbound highway traffic is partially shielded by a naturally occurring series of small sand dunes on the western portion of the site. Once traffic passes the sand dune buffer, the site becomes visible. The view from the nearest residences situated approximately 4.3 kilometers (2.6 miles) away is also limited by onsite sand dunes.

Properties adjacent to the site include Wallach Concrete, Inc., and Sundance Services, Inc., to the north and WCS to the east. The site is visible from these properties and slightly visible from the Lea County landfill, located to the southeast, and from DD Landfarm, located to the west.

3.5 Climatology, Meteorology, and Air Quality

3.5.1 Regional Climatology

The climate in the region of the proposed NEF site is semi-arid with mild temperatures, low precipitation and humidity, and a high evaporation rate. The weather is often dominated in the winter by a high-pressure system in the central part of the western United States and a low-pressure system in north-central Mexico. The region is affected by a low-pressure system located over Arizona in the summer.

3.5.2 Site and Regional Meteorology

There are no site-specific meteorological data available at the proposed NEF site. Data is available from WCS, 1.6 kilometers (1 mile) from the proposed NEF site, but these data are not fully verified. Climatological averages for atmospheric variables such as temperature, pressure, winds, and precipitation presented in this Draft EIS are based on data collected from four weather stations. These stations are located in Eunice, New Mexico; Hobbs, New Mexico; Roswell, New Mexico; and Midland-Odessa,



Source: Louisiana Energy Services, "National Enrichment Facility Environmental Report," Revision 0, December 2003, 020604_02_TB

Figure 3-7 View of the West Half of the Proposed NEF Site (LES, 2004a)

Texas (Figure 3-1). Table 3-1 presents the distances and directions of these stations from the site and the length of the records for the reported data.

Table 3-1 Weather Stations Located near the Proposed NEF Site

Station	Distance and Direction from Proposed Site	Length of Record*	Station Elevation (meters)
Eunice, New Mexico	8 kilometers (5 miles) west of site	1 (1993)	1,050
Hobbs, New Mexico	32 kilometers (20 miles) north of site	16 (1982-1997)	1,115
Midland-Odessa, Texas	103 kilometers (64 miles) southeast of site	16 (1982-1997)	872
Roswell, New Mexico	161 kilometers (100 miles) northwest of site	16 (1982-1997)	1,118

* Years of compiled data for climatological analysis.

Source: WRCC, 2004

The Midland-Odessa monitoring station is the closest first-order National Weather Service station to the proposed NEF site. First-order weather stations record a complete range of meteorological parameters for 24-hour periods, and they are usually fully instrumental (NCDC, 2003). The National Oceanic and Atmospheric Administration (NOAA) compiles and certifies the hourly meteorological data for Midland-Odessa, Roswell, and Hobbs (NCDC, 1998). In addition to hourly data, the Western Regional Climate Center compiles and certifies the climatological summaries for Hobbs (WRCC, 2004). The State of New Mexico Environment Department Air Quality Bureau collects the only available data from Eunice (NMAQB, 2003).

3.5.2.1 Temperature

Local climate data are available from a monitoring station in Hobbs, New Mexico. The Hobbs station is a part of the National Climatic Data Center Cooperative Network. The Hobbs, New Mexico, station shows a mean annual temperature of 16.6°C (61.9 °F) with the mean monthly temperature ranging from 5.7°C (42.2°F) in January to 26.8°C (80.2°F) in July. The highest daily maximum temperature on record is 45.6°C (114°F) (June 27, 1998) and the lowest daily minimum temperature is -21.7°C (-7°F) (January 11, 1962). Table 3-2 presents a summary of temperatures in the Hobbs area from 1914 to 2003.

3.5.2.2 Precipitation

The normal annual total rainfall as measured in Hobbs is 40 centimeters (16 inches). Precipitation amounts range from an average of 1.14 centimeter (0.45 inch) in January to 6.68 centimeters (2.63 inches) in September.

Maximum and minimum monthly totals are 35 centimeters (13.8 inches) and zero. Table 3-3 presents a summary of precipitation in the Hobbs area for monthly and annual means.

Summer rains fall almost entirely during brief, but frequently intense thunderstorms. The general southeasterly circulation from the Gulf of Mexico brings moisture from these storms into the State of New Mexico, and strong surface heating combined with orographic lifting as the air moves over higher terrain causes air currents and condensations. Orographic lifting occurs when air is intercepted by a mountain and is forcefully raised up over the mountain, cooling as it rises. If the air cools to its

saturation point, the water vapor condenses and a cloud forms. August and September are the rainiest months with 30 to 40 percent of the year's total moisture falling at that time.

Table 3-2 Summary of Monthly Temperatures at Hobbs, New Mexico, from 1914 to 2003*

Month	Monthly Averages			Daily Extremes			
	Maximum	Minimum	Mean	High	Date	Low	Date
January	13.6°C (56.5°F)	-2.3°C (27.9°F)	5.7°C (42.2°F)	28.3°C (83°F)	01/11/1953	-21.7°C (-7°F)	01/11/1962
February	16.7°C (62.0°F)	0.0°C (32.0°F)	8.3°C (47.0°F)	30.6°C (87°F)	02/12/1962	-18.9°C (-2°F)	02/02/1985
March	20.5°C (68.9°F)	2.9°C (37.3°F)	11.7°C (53.1°F)	35.0°C (95°F)	03/27/1971	-17.2°C (1°F)	03/02/1922
April	25.5°C (77.8°F)	7.9°C (46.2°F)	16.7°C (62.0°F)	36.7°C (98°F)	04/30/1928	-7.8°C (18°F)	04/04/1920
May	29.7°C (85.5°F)	13.0°C (55.3°F)	21.3°C (70.4°F)	41.7°C (107°F)	05/30/1951	1.1°C (34°F)	05/02/1916
June	33.8°C (92.9°F)	17.5°C (63.4°F)	25.6°C (78.1°F)	45.6°C (114°F)	06/27/1998	4.4°C (40°F)	06/03/1919
July	34.3°C (93.8°F)	19.2°C (66.6°F)	26.8°C (80.2°F)	43.3°C (110°F)	07/15/1958	10.0°C (50°F)	07/01/1927
August	33.4°C (92.1°F)	18.7°C (65.6°F)	26.0°C (78.8°F)	41.7°C (107°F)	08/09/1952	8.3°C (47°F)	08/29/1916
September	30.0°C (85.9°F)	15.2°C (59.4°F)	22.6°C (72.6°F)	40.6°C (105°F)	09/05/1948	1.1°C (34°F)	09/23/1948
October	25.1°C (77.1°F)	9.2°C (48.5°F)	17.1°C (62.8°F)	36.7°C (98°F)	10/03/2000	-11.1°C (12°F)	10/29/1917
November	18.5°C (65.2°F)	2.6°C (36.7°F)	10.5°C (50.9°F)	31.1°C (88°F)	11/01/1952	-15.6°C (4°F)	11/29/1976
December	14.5°C (58.1°F)	-1.3°C (29.6°F)	6.7°C (44.0°F)	28.9°C (84°F)	12/09/1922	-17.2°C (-1°F)	12/24/1983

*For monthly and annual means, thresholds, and sums: months with five or more missing days are not considered, years with one or more missing months are not considered.

Source: WRCC, 2004.

As these storms move inland, much of the moisture is precipitated over the coastal and inland mountain ranges of California, Nevada, Arizona, and Utah. Much of the remaining moisture falls on the western slope of the Continental Divide and over northern and high-central mountain ranges. Winter is the driest season in New Mexico except for the portion west of the Continental Divide. This dryness is most noticeable in the Central Valley and on eastern slopes of the mountains. In New Mexico, much of the winter precipitation falls as snow in the mountain areas, but it may occur as either rain or snow in the valleys.

Table 3-3 Summary of Monthly Precipitation at Hobbs, New Mexico, from 1914 To 2003

Month	Precipitation							Total Snowfall		
	Mean	High	Year	Low	Year	1-Day Maximum		Mean	High	Year
January	1.14 cm (0.45 in)	7.52 cm (2.96 in)	1949	0.00	1924	3.07 cm (1.21 in)	01/11/1949	3.56 cm (1.4 in)	31.75 cm (12.5 in)	1983
February	1.14 cm (0.45 in)	6.20 cm (2.44 in)	1923	0.00	1917	3.53 cm (1.39 in)	02/05/1988	3.05 cm (1.2 in)	36.32 cm (14.3 in)	1973
March	1.35 cm (0.53 in)	7.57 cm (2.98 in)	2000	0.00	1918	5.08 cm (2.00 in)	03/20/2002	1.52 cm (0.6 in)	25.40 cm (10.0 in)	1958
April	2.03 cm (0.80 in)	13.13 cm (5.17 in)	1922	0.00	1917	4.75 cm (1.87 in)	04/20/1926	0.51 cm (0.2 in)	22.86 cm (9.0 in)	1983
May	5.23 cm (2.06 in)	35.13 cm (13.83 in)	1992	0.00	1938	13.21 cm (5.20 in)	05/22/1992	0.0	0.0	1948
June	4.78 cm (1.88 in)	23.62 cm (9.30 in)	1921	0.00	1924	11.23 cm (4.42 in)	06/07/1918	0.0	0.0	1948
July	5.36 cm (2.11 in)	23.90 cm (9.41 in)	1988	0.00	1954	11.35 cm (4.47 in)	07/19/1988	0.0	0.0	1948
August	6.02 cm (2.37 in)	23.29 cm (9.17 in)	1920	0.10 cm (0.04 in)	1938	11.30 cm (4.45 in)	08/09/1984	0.0	0.0	1948
September	6.68 cm (2.63 in)	32.99 cm (12.99 in)	1995	0.00	1939	19.05 cm (7.50 in)	09/15/1995	0.0	0.0	1948
October	3.99 cm (1.57 in)	20.70 cm (8.15 in)	1985	0.00	1917	14.22 cm (5.60 in)	10/09/1985	0.25 cm (0.1 in)	11.43 cm (4.5 in)	1976
November	1.45 cm (0.57 in)	11.00 cm (4.33 in)	1978	0.00	1915	9.65 cm (3.80 in)	11/04/1978	1.52 cm (0.6 in)	41.91 cm (16.5 in)	1980
December	1.42 cm (0.56 in)	12.90 cm (5.08 in)	1986	0.00	1917	4.72 cm (1.86 in)	12/21/1942	2.54 cm (1.0 in)	24.13 cm (9.5 in)	1986
Annual	40.59 cm (15.98 in)	81.76 cm (32.19 in)	1941	13.41 cm (5.28 in)	1917	19.05 cm (7.50 in)	09/15/1995	12.95 cm (5.1 in)	68.83 cm (27.1 in)	1980

cm - centimeter.

in - inch.

Source: WRCC, 2004.

Climatological data collected from the Midland-Odessa station indicate the relative humidity throughout the year ranges from 45 to 61 percent, with the highest humidity occurring during the early morning hours (LES, 2004a).

3.5.2.3 Meteorological Data Analyses

The NRC staff examined the data from the four meteorological stations in Table 3-1 (NCDC, 1998; NMAQB, 2003). Because the Eunice meteorological data are limited to 1993, annual wind roses for Midland-Odessa, Roswell, Hobbs, and Eunice for 1993 were compared (Figure 3-8). From this one-year comparison, the general wind patterns for Midland-Odessa, Hobbs, and Eunice were somewhat similar. Roswell data, on the other hand, appeared to be different with a stronger northerly and westerly component. To illustrate such comparison further, Figure 3-9 presents the frequency distributions of atmospheric stability classes that were plotted for the 1993 data.

Histograms of atmospheric stability at Midland-Odessa, Roswell, Hobbs, and Eunice for the same year show that the stability-class frequency distribution for Midland-Odessa and Hobbs are similar. Distributions for Eunice and Roswell are different from Midland-Odessa and Hobbs. Stability class was determined using the solar radiation/cloud cover method for Midland-Odessa, Roswell, and Hobbs. The New Mexico Air Quality Bureau provided stability categories for Eunice, which is limited to one year of data (NMAQB, 2003). Also, no information was available on the methods used to calculate the stability categories at this location.

Table 3-4 presents a statistical summary of the data completeness for Hobbs and Midland-Odessa that was performed to comply with Environmental Protection Agency (EPA) data completeness guidance for air quality modeling. The EPA requires that meteorological data be at least 75-percent complete (with less than 25 percent missing data) to be reliably usable as inputs for dispersion models (EPA, 2003b). Despite the fact that Hobbs is the closest station to the proposed NEF site, the Hobbs data did not meet the 75-percent completeness criteria. Therefore, these data were not used for dispersion modeling. However, Hobbs observations can be used for a general description of the meteorological conditions at the proposed NEF site as they are all located within the same region and have similar climates.

Midland-Odessa and Hobbs had comparable climate data based on a comparative analysis of meteorological data at the four locations surrounding the proposed NEF site. Roswell climate data were different, and Eunice data had too many severe shortcomings to be used reliably. Since Midland-Odessa

Atmospheric Stability Classes

Stability classes are used to assess the dispersion behavior of materials released into the atmosphere. Dispersion is affected by ambient air temperature changes with height above ground and is categorized by Pasquill. Seven stability classes for use in dispersion calculations are established. Many times, the EPA and NRC will use only six stability classes by merging the sixth and seven (F and G) classes into one class.

<i>Stability Classification</i>	<i>Pasquill Category</i>	<i>Temperature Change with Height (°C/100 meters)</i>
<i>Extremely Unstable</i>	<i>A</i>	<i><-1.9</i>
<i>Moderately Unstable</i>	<i>B</i>	<i>-1.9 to -1.7</i>
<i>Slightly Unstable</i>	<i>C</i>	<i>-1.7 to -1.5</i>
<i>Neutral</i>	<i>D</i>	<i>-1.5 to -0.5</i>
<i>Slightly Stable</i>	<i>E</i>	<i>-0.5 to 1.5</i>
<i>Moderately Stable</i>	<i>F</i>	<i>1.5 to 4.0</i>
<i>Extremely Stable</i>	<i>G</i>	<i><4.0</i>

Source: NRC, 1972.

was a first-order weather station with data completeness exceeding EPA guidance, it was used as the representative meteorological station for the dispersion modeling needs in this Draft EIS.

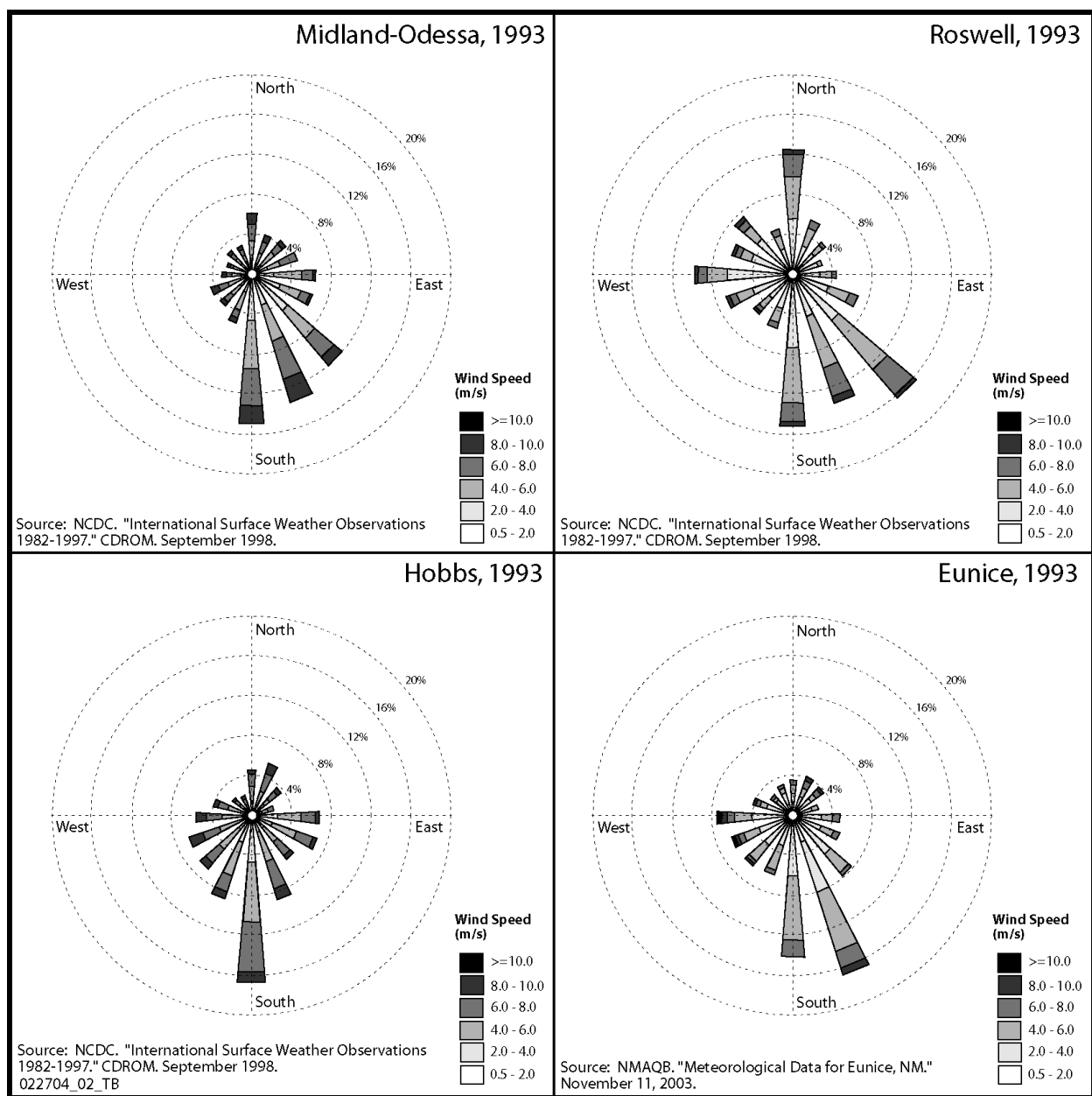
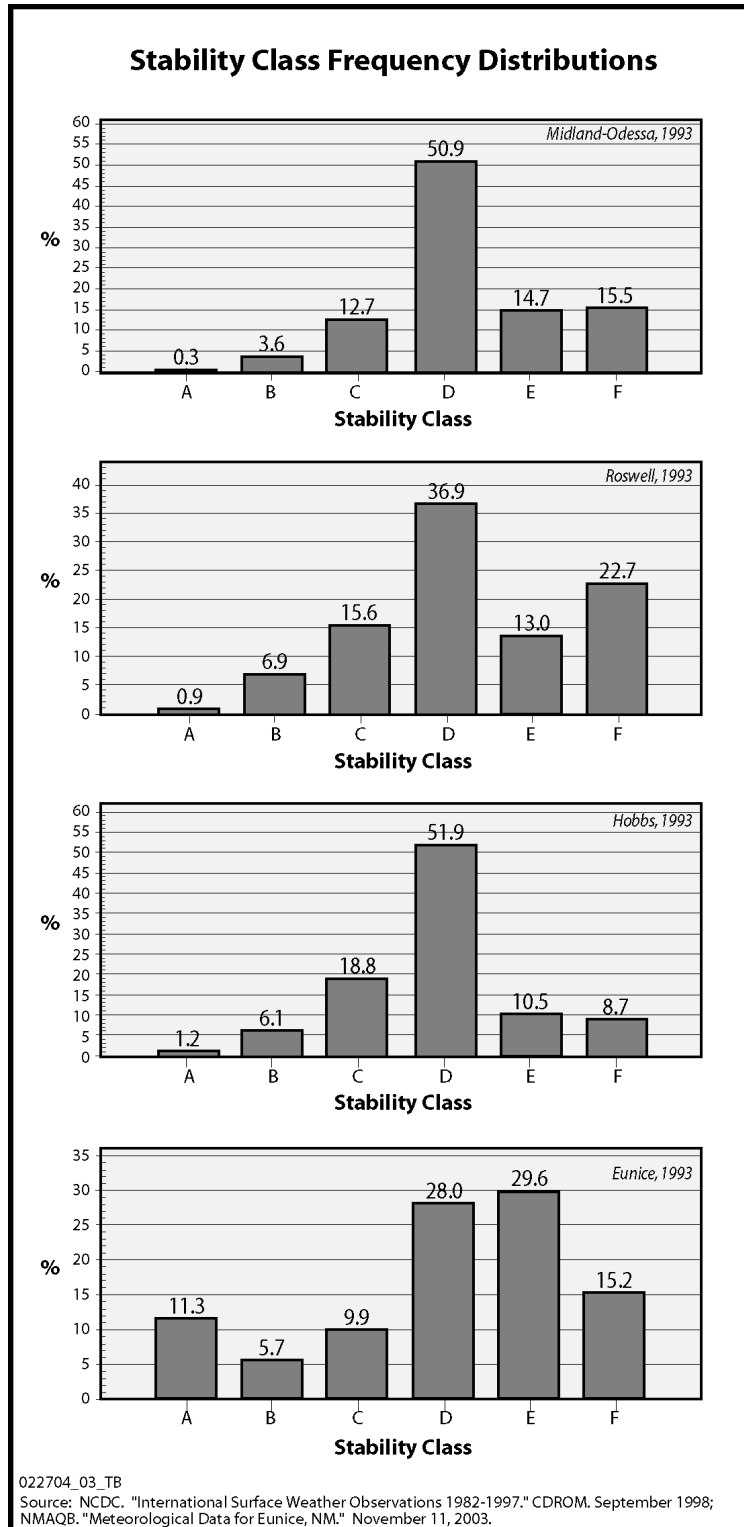


Figure 3-8 Wind Roses for Midland-Odessa, Roswell, Hobbs, and Eunice for 1993 (NCDC, 1998; NMAQB, 2003)



**Figure 3-9 Histograms of Stability Categories for
Midland-Odessa, Roswell, Hobbs, and Eunice, 1993
(NCDC, 1998; NMAQB, 2003)**

Table 3-4 Statistical Summary of the Data Completeness for Midland-Odessa and Hobbs

Hobbs, NM			Midland-Odessa, NM		
Year	Number of Observations	% Complete	Year	Number of Observations	% Complete
1990	5,670	64.7	1990	8,168	93.2
1991	5,768	65.8	1991	8,251	94.2
1992	5,985	68.1	1992	8,431	96.0
1993	5,767	65.8	1993	8,368	95.5
1994	5,770	65.9	1994	8,325	95.0
1995	5,399	61.6	1995	7,863	89.8
1996	5,627	64.1	1996	6,621	75.4
1997	5,640	64.4	1997	8,208	93.7

Source: NCDC, 1998.

3.5.2.4 Winds and Atmospheric Stability

Wind speeds over the State of New Mexico are usually moderate, although relatively strong winds often accompany occasional frontal activity during late winter and spring months and sometimes occur just in advance of thunderstorms. Frontal winds may exceed 13 meters per second (30 miles per hour) for several hours and reach peak speeds of more than 22 meters per second (50 miles per hour).

Spring is the windy season. Blowing dust and serious soil erosion of unprotected fields may be a problem during dry spells. Winds are generally stronger in the eastern plains than in other parts of the State. Winds generally predominate from the southeast in summer and from the west in winter, but local surface wind directions will vary greatly because of local topography and mountain and valley breezes.

The hourly meteorological observations at Midland-Odessa were used to generate wind rose plots. Figure 3-10 shows wind speed and direction frequency for the years 1987 to 1991. Calculated annual mean wind speed was 5.1 meters per second (11.4 miles per hour), with prevailing winds from the south and a maximum 5-second wind speed of 31.2 meters per second (70 miles per hour). Figure 3-11 presents frequency distributions of wind speed and direction as a function of Pasquill stability class (A-F). The most stable classes—E and F—occur 18.9 and 13 percent of the time, respectively. The least stable classes, A and B, occur 0.3 and 3.5 percent of the time, respectively. Figure 3-12 presents frequency distribution data analyzed for a five-year period (1987-1991) at the Midland-Odessa National Weather Service.

The use of recent data generated at WCS from October 1999 through August 2002 (LES, 2004a) shows a similarity in wind patterns and distribution of wind speed between the Midland-Odessa and WCS locations. Although the meteorological data are from different time periods and the two sites are separated in distance, the data from both sites show a predominance of southerly winds, and both data sets shows similar distributions of wind speed.

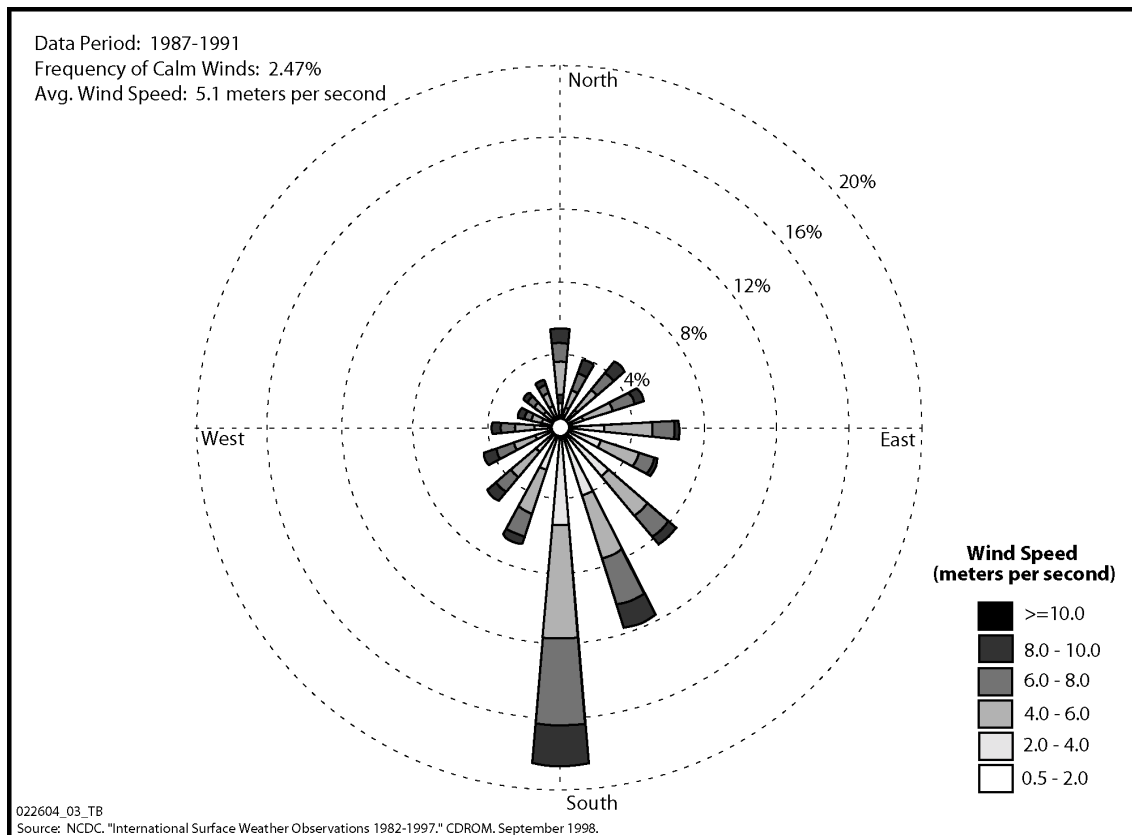


Figure 3-10 Wind Rose for Midland-Odessa, 1987-1991 (NCDC, 1998)

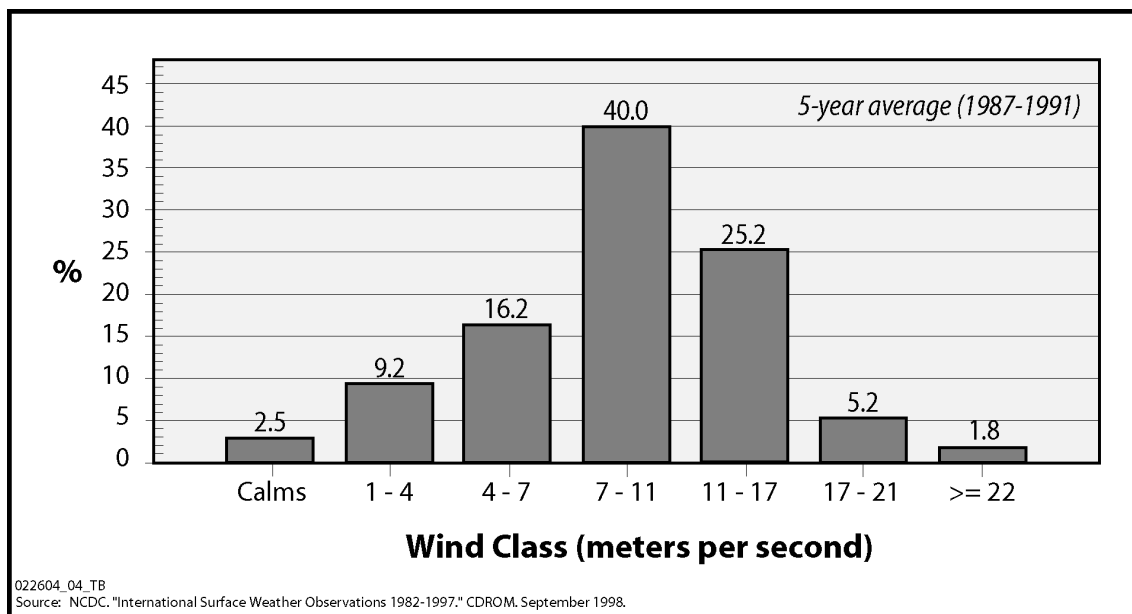


Figure 3-11 Wind Distribution for Midland-Odessa, 1987-1991 (NCDC, 1998)

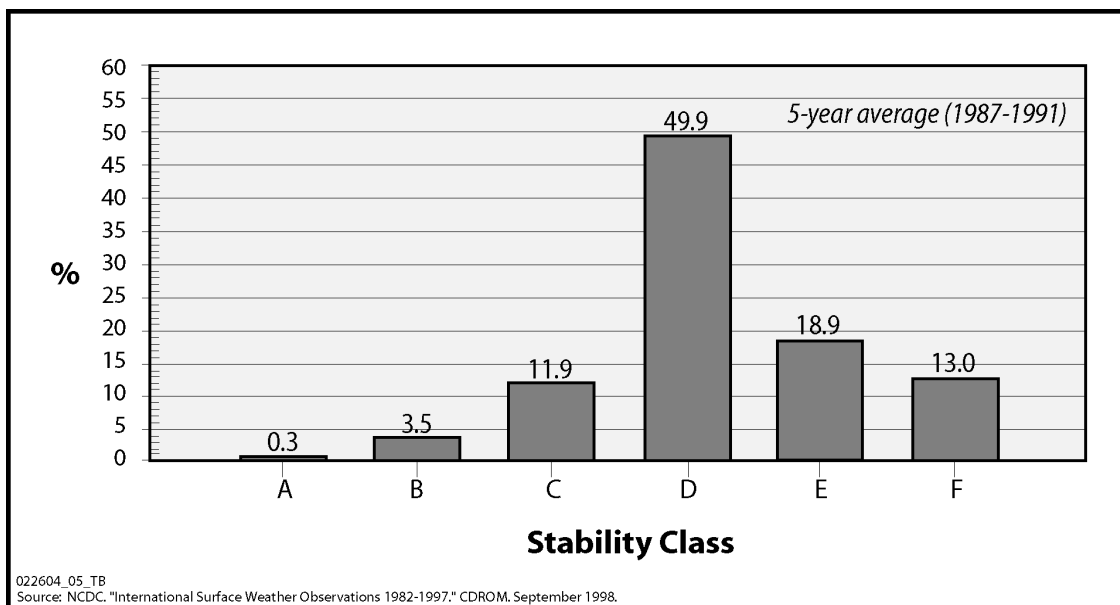


Figure 3-12 Distribution of Stability Classes for Midland-Odessa, 1987-1991 (NCDC, 1998)

3.5.2.5 Severe Weather Conditions

According to data from Midland-Odessa, thunderstorms occur an average of 36.4 days/year in the southeastern area of New Mexico where the proposed site is located. Thunderstorms are most frequent in summer, averaging 17.4 days per year, and least frequent in winter, averaging 1.3 days per year. Occasionally, thunderstorms are accompanied by hail.

Using Marshall's methodology for determining attractive area and lightning strike frequency, it was determined that the proposed NEF site has an attractive area of 0.34 square kilometer (0.13 square mile) and a lightning strike frequency of 1.36 flashes per year. Only two lightning events having sufficient intensity to cause loss of life, injury, significant property damage, and/or disruption to commerce were reported in Lea County, New Mexico, between January 1, 1950, and April 30, 2004 (NCDC, 2004). The closest lightning event occurred in Hobbs with minor property damage of \$3,000 on August 12, 1997. The second occurred in Lovington on August 8, 1996, causing two deaths.

Tornadoes are occasionally reported in New Mexico, most frequently during afternoon and early evening hours from May through August. There is an average of nine tornadoes a year in New Mexico, and the occurrence of tornadoes in the vicinity of the proposed NEF site is rare. Tornadoes are classified using the F-scale with classifications ranging from F0-F5 (NOAA, 2004). F0-classified tornadoes have winds of 64 to 116 kilometers per hour (40 to 72 miles per hour), and F2-classified tornadoes have winds of 182 to 253 kilometers per hour (113 to 157 miles per hour). The F5-classified tornadoes have winds of 420 to 512 kilometers per hour (261 to 318 miles per hour). Eighty-seven tornadoes of low magnitude (F0 to F2) were reported in Lea County, New Mexico, between January 1, 1950, and April 30, 2004. Only one additional tornado was reported as F3 on May 17, 1954. Two tornadoes, one in 1998 and the second in 1999, had a magnitude of F0 and were located near Eunice. All the reported tornadoes were associated with very light damage (NCDC, 2004).

The proposed NEF site is located about 805 kilometers (500 miles) from the coast. Because hurricanes lose their intensity quickly once they pass over land, a hurricane would most likely lose its intensity before reaching the proposed NEF site and dissipate into a tropical depression.

Blowing sand or dust may occur occasionally in the area due to the combination of strong winds, sparse vegetation, and the semi-arid climate. High winds associated with thunderstorms are frequently a source of localized blowing dust. Sandstorms that cover an extensive region are rare. No dust storms were reported in Lea County, New Mexico, between January 1, 1950 and April 30, 2004 (NCDC, 2004).

3.5.2.6 Mixing Heights

Mixing height is defined as the height above the earth's surface through which relatively strong vertical mixing of the atmosphere occurs. G.C. Holzworth developed mean annual morning and afternoon mixing heights for the contiguous United States (Holzworth, 1972). According to Holzworth's calculations, the mean annual morning and afternoon mixing heights at the proposed NEF site are approximately 436 meters (1,430 feet) and 2,089 meters (6,854 feet), respectively. Table 3-5 shows the average morning and afternoon mixing heights for Midland-Odessa, Texas.

Table 3-5 Average Morning and Afternoon Mixing Heights for Midland-Odessa, Texas

	Winter	Spring	Summer	Fall	Annual
Morning	290 meters (951 feet)	429 meters (1,407 feet)	606 meters (1,988 feet)	419 meters (1,375 feet)	436 meters (1,430 feet)
Afternoon	1,276 meters (4,186 feet)	2,449 meters (8,035 feet)	2,744 meters (9,003 feet)	1,887 meters (6,191 feet)	2,089 meters (6,854 feet)

Source: Holzworth, 1972.

3.5.3 Air Quality

To assess air quality, the EPA has established maximum concentrations for pollutants that are referred to as the National Ambient Air Quality Standards (EPA, 2003a). Table 3-6 presents a list of the National Ambient Air Quality Standards and the State of New Mexico Air Quality Standards. Six criteria pollutants are used as indicators of air quality: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead (EPA, 2003a). Figure 3-13 shows the criteria air-pollutants attainment areas (i.e., areas within which air quality standards are met). Both Lea and Andrews Counties are in attainment for all of the EPA criteria pollutants (EPA, 2004a).

EPA lists 54 sources of criteria pollutants in Lea County, 8 sources in Andrews County, and 5 sources in Gaines County for 2001. None of these sources are located near the proposed site. Table 3-7 presents a summary of the annual emissions for six of the criteria air pollutants for the three counties surrounding the proposed NEF site.

The New Mexico Environment Department Air Quality Bureau operates a monitoring station about 32 kilometers (20 miles) north of the proposed NEF site in Hobbs, New Mexico, that monitors particulate matter. Readings from this monitoring station show that there are no instances of particulate matter exceeding the National Ambient Air Quality Standards (EPA, 2002a).

**Table 3-6 EPA National Ambient Air Quality Standards and State of New Mexico
Air Quality Standards**

Pollutant	EPA Standard Value ^a		Standard Type	New Mexico Standard
<i>Carbon Monoxide (CO)</i>				
8-hour Average	9 ppm	(10 mg/m ³)	Primary	8.7 ppm
1-hour Average	35 ppm	(40 mg/m ³)	Primary	13.1 ppm
<i>Nitrogen Dioxide (NO₂)</i>				
Annual Arithmetic Mean	0.053 ppm	(100 µg/m ³)	Primary and Secondary	0.05 ppm
<i>Ozone (O₃)</i>				
1-hour Average	0.12 ppm	(235 µg/m ³)	Primary and Secondary	None
8-hour Average	0.08 ppm	(157 µg/m ³)	Primary and Secondary	None
<i>Lead (Pb)</i>				
Quarterly Average	1.5 µg/m ³		Primary and Secondary	None
<i>Particulate (PM₁₀) Particles with diameters of 10 µm or less</i>				
Annual Arithmetic Mean	50 µg/m ³		Primary and Secondary	60 µg/m ³
24-hour Average	150 µg/m ³		Primary and Secondary	150 µg/m ³
<i>Particulate (PM_{2.5}) Particles with diameters of 2.5 µm or less</i>				
Annual Arithmetic Mean	15 µg/m ³		Primary and Secondary	None
24-hour Average	65 µg/m ³		Primary and Secondary	None
<i>Sulfur Dioxide (SO₂)</i>				
Annual Arithmetic Mean	0.03 ppm	(80 µg/m ³)	Primary	0.02 ppm
24-hour Average	0.14 ppm	(365 µg/m ³)	Primary	0.10 ppm
3-hour Average	0.50 ppm	(1,300 µg/m ³)	Secondary	None

^a Parenthetical value is an approximately equivalent concentration.

µm - 10⁻⁶ meters or 0.000001 meters.

ppm - parts per million.

µg/m³ - micrograms per cubic meter.

mg/m³ - milligrams per cubic meter.

Source: EPA, 2003a; NMED, 2002.

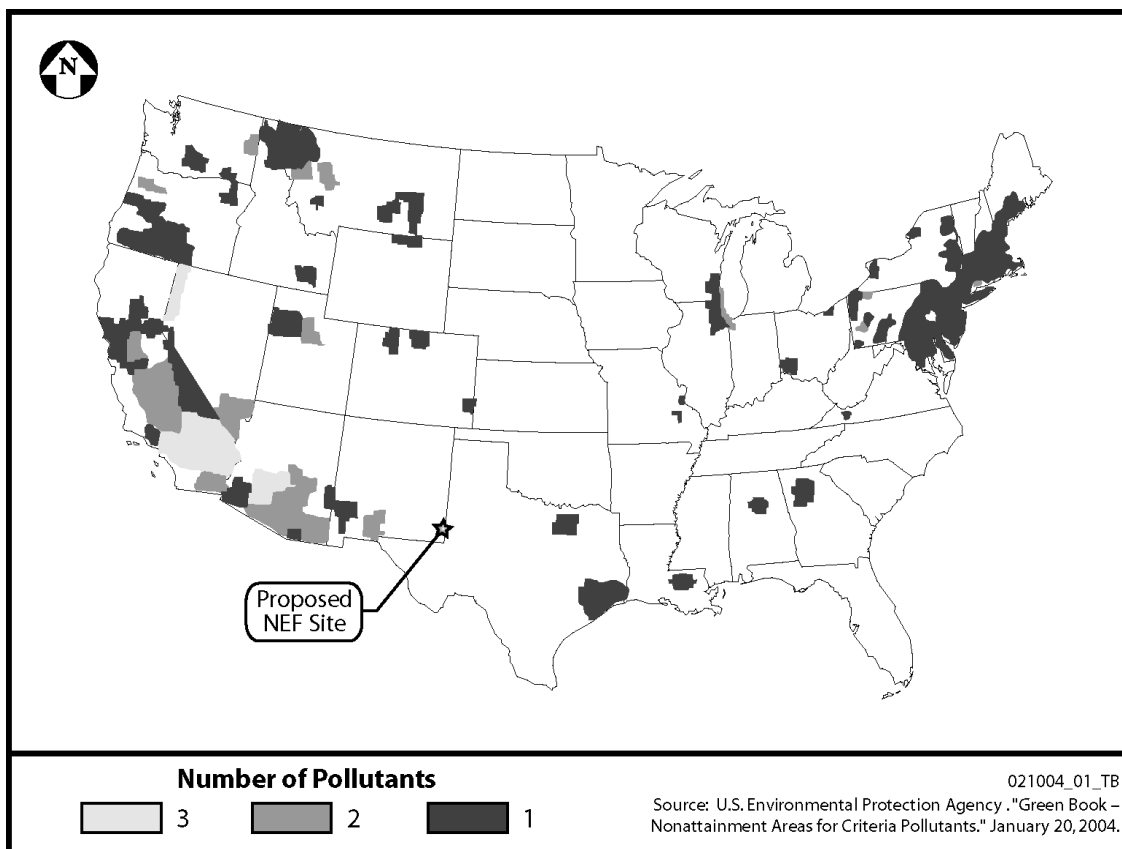


Figure 3-13 Criteria Air Pollutants Attainment Areas (EPA, 2004a)

Table 3-7 Total Annual Emissions (tons per year) of Criteria Air Pollutants at Lea County, New Mexico, and Andrews and Gaines Counties, Texas

County, State	VOC	NO _x	CO	SO ₂	PM _{2.5}	PM ₁₀
Lea County, New Mexico	6,713	38,160	31,185	16,096	5,188	28,548
Andrews County, Texas	2,873	3,259	6,680	1,398	440	1,577
Gaines County, Texas	2,696	2,791	7,709	735	1,825	8,650

A ton is equal to 0.9078 metric ton.

VOC: volatile organic compounds.

NO_x: nitrogen oxides.

CO: carbon monoxide.

SO₂: sulfur dioxide.

PM_{2.5}: particulate matter less than 2.5 microns.

PM₁₀: particulate matter less than 10 microns.

Source: Based on 1999 data (EPA, 2003d).

Criteria Pollutants

Nitrogen dioxide is a brownish, highly reactive gas that is present in all urban atmospheres. Nitrogen dioxide can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. The major mechanism for the formation of nitrogen dioxide in the atmosphere is the oxidation of the primary air pollutant nitric oxide. Nitrogen oxides play a major role, together with volatile organic carbons, in the atmospheric reactions that produce ozone. Nitrogen oxides form when fuel is burned at high temperatures. The two major emissions sources are transportation and stationary fuel combustion sources such as electric utility and industrial boilers.

Ozone is a photochemical (formed in chemical reactions between volatile organic compounds and nitrogen oxides in the presence of sunlight) oxidant and the major component of smog. Exposure to ozone for several hours at low concentrations has been shown to significantly reduce lung function and induce respiratory inflammation in normal, healthy people during exercise. Other symptoms include chest pain, coughing, sneezing, and pulmonary congestion.

Lead can be inhaled and ingested in food, water, soil, or dust. High exposure to lead can cause seizures, mental retardation, and/or behavioral disorders. Low exposure to lead can lead to central nervous system damage.

Carbon monoxide is an odorless, colorless, poisonous gas produced by incomplete burning of carbon in fuels. Exposure to carbon monoxide reduces the delivery of oxygen to the body's organs and tissues. Elevated levels can cause impairment of visual perception, manual dexterity, learning ability, and performance of complex tasks.

Particulate matter such as dust, dirt, soot, smoke, and liquid droplets are emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural windblown dust. Exposure to high concentrations of particulate matter can affect breathing, cause respiratory symptoms, aggravate existing respiratory and cardiovascular disease, alter the body's defense systems against foreign materials, damage lung tissue, and cause premature death.

Sulfur dioxide results largely from stationary sources such as coal and oil combustion, steel and paper mills, and refineries. It is a primary contributor to acid rain and contributes to visibility impairments in large parts of the country. Exposure to sulfur dioxide can affect breathing and may aggravate existing respiratory and cardiovascular disease.

Source: EPA, 2004a.

3.6 Geology, Minerals, and Soils

This section provides a brief description of regional and local geology and identifies the characteristics of the soil and mineral resources at the proposed NEF site. As described in Chapter 1 of this Draft EIS, the NRC staff process for reviewing the license application includes an examination of the ability of the proposed NEF to withstand earthquakes. The discussion of geology in this section, however, is not intended to support a detailed safety analysis of the proposed NEF to resist seismic events. The NRC staff will document its analysis of hazards related to earthquakes in the Safety Evaluation Report.

3.6.1 Regional Geology

The proposed NEF site is located near the boundary between the Southern High Plains section (Llano Estacado) of the Great Plains Province to the east and the Pecos Plains section to the west. Figure 3-14 shows the regional physiography of the area.

The primary difference between the Pecos Plains and the Southern High Plains physiographic sections is a change in topography. The High Plains is a large flat mesa that uniformly slopes to the southeast. The Pecos Plains section is characterized by its more irregular erosional topographic expression (Scholle, 2000). The boundary between the two sections is locally referred to as Mescalero Ridge. In southern Lea County, Mescalero Ridge is an irregular erosional topographic feature with a relief of about 9 to 15 meters (30 to 50 feet) compared with a nearly vertical cliff and relief of approximately 46 meters (150 feet) in northwestern Lea County. The lower relief of the ridge in the southeastern part of the county is due to partial cover by wind-deposited sand. The proposed NEF site is located on the Southern High Plains, about 6.2 to 9.3 kilometers (10 to 15 miles) from the ridge.

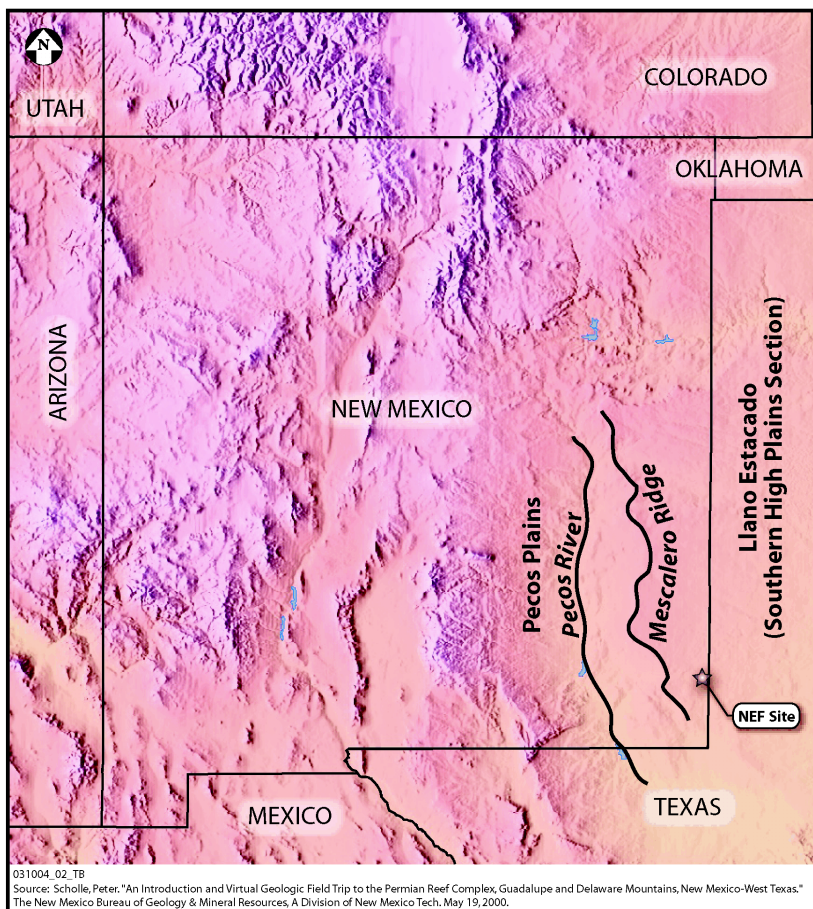


Figure 3-14 Regional Physiography (Scholle, 2000)

The dominant geologic feature of this region is the Permian Basin. The Permian Basin is a massive subsurface bedrock structure that has a downward flexure of a large thickness of originally flat-lying, bedded, sedimentary rock. The Permian Basin extends to 4,880 meters (16,000 feet) below mean sea level. Figure 3-15 shows the major physiographic features of the Permian Basin (LES, 2004a).

The proposed NEF site is located within the Central Basin Platform area. The Central Basin Platform divides the Permian Basin into the Midland and Delaware subbasins. The top of the Permian deposits are approximately 434 meters (1,425 feet) below ground surface at the proposed NEF site. Overlying the Permian are the sedimentary rocks of the Triassic Age Dockum Group.

The upper formation of the Dockum Group is the Chinle Formation, a tight claystone and silty clay layer. The Chinle Formation is regionally extensive with outcrops as far away as the Grand Canyon region in Arizona. In the vicinity of the site, the Chinle Formation consists of red, purple, and greenish micaceous claystone and siltstone with interbedded fine-grained sandstone. The Chinle (also known as Red Bed) Formation is overlain by Tertiary Ogallala, Gatuña, or Antlers Formations (alluvial deposits). Only the latter two are found at the proposed NEF site. Caliche is a partly indurated zone of calcium carbonate accumulation formed in the upper layers of surficial deposits. Soft caliche is interbedded with the alluvial deposits near the surface. A fractured caliche layer can be found extending to the surface near the proposed NEF site. This "caprock" is not present at the proposed NEF site. Quaternary (dune) sands frequently overlie the Tertiary alluvial deposits (LES, 2004a). Figure 3-16 shows a generalized cross-section of these formations in the site area.

Red Bed Ridge is an escarpment of about 15 meters (50 feet) in height that occurs just north and northeast of the proposed NEF site. It is a buried ridge on the upper surface of the Red Bed Formation and extends for at least 161 kilometers (100 miles) from northern Lea County, New Mexico through western Andrews County, Texas and southward. The Red Bed Ridge is not associated with the Mescalero Escarpment.

The Southeast New Mexico-West Texas area is considered to be structurally stable. Since the Laramide Orogeny (a series of mountain-building events that affected much of western North America in Late

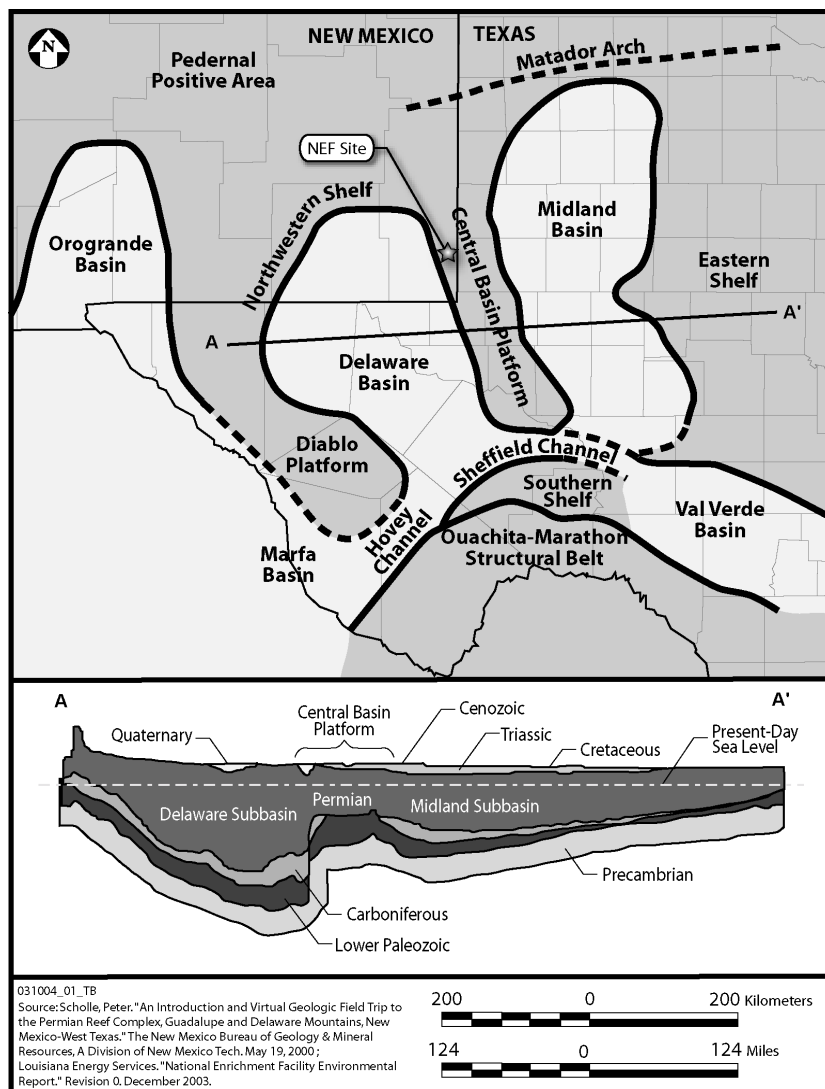


Figure 3-15 Major Physiographic Features of the Permian Basin (Scholle, 2000; LES, 2004a)

Cretaceous and Early Tertiary time), the Permian Basin has subsided slightly, most likely as a result of the dissolution of the Permian evaporate layers by ground-water infiltration and possibly from oil and gas extraction.

Two types of faulting are associated with the early Permian deformation. Most of the faults are long, high-angle reverse faults with well over 100 meters (328 feet) of vertical displacement that often involved the Precambrian basement rocks. The second type of faulting is found along the western margin of the platform where long strike-slip faults with displacements of tens of kilometers are found. The closest evaluated fault to the site is over 161 kilometers (100 miles) to the northwest associated with the deeper portions of the Permian Basin. No major tectonic event has occurred within the Permian Basin since the Laramide Orogeny that ended about 35-million years ago (WCS, 2004c). Recently, a small reverse fault in the Triassic beds with about 3 to 6 meters (10 to 20 feet) of offset was observed on the WCS site

approximately one mile to the east of the proposed NEF in Texas. Geologically, the fault has had no observable affect on the overlying Cretaceous Antlers Formation or the Caprock caliche. The fault in the Triassic beds, which is believed to be inactive, predates the Antlers Formation, which is about 135 million years old. (WCS, 2004c; NRC, 2004).

There has been virtually no tectonic movement within the basin since the Permian period. The faults that uplifted the platform do not appear to have displaced the younger Permian sediments. No Quaternary age faults were identified in New Mexico within 161 kilometers (100 miles) of the site. Quaternary age faults within 240 kilometers (150 miles) of the site include the Guadalupe fault located approximately 191 kilometers (119 miles) west of the site in New Mexico and in Texas; and the West Delaware Mountains fault zone, the East Sierra Diablo fault, and the East Flat Top Mountain fault, located 185 kilometers (115 miles) southwest, and 196 kilometers (122 miles) southwest, and 200 kilometers (124 miles) west-southwest of the site, respectively. The East Baylor Mountain-Carrizo Mountain fault, located 201 kilometers (125 miles) southwest of the NEF site, is considered a possible capable fault but there has been no demonstration of movement within the last 35,000 years (LES, 2004a).

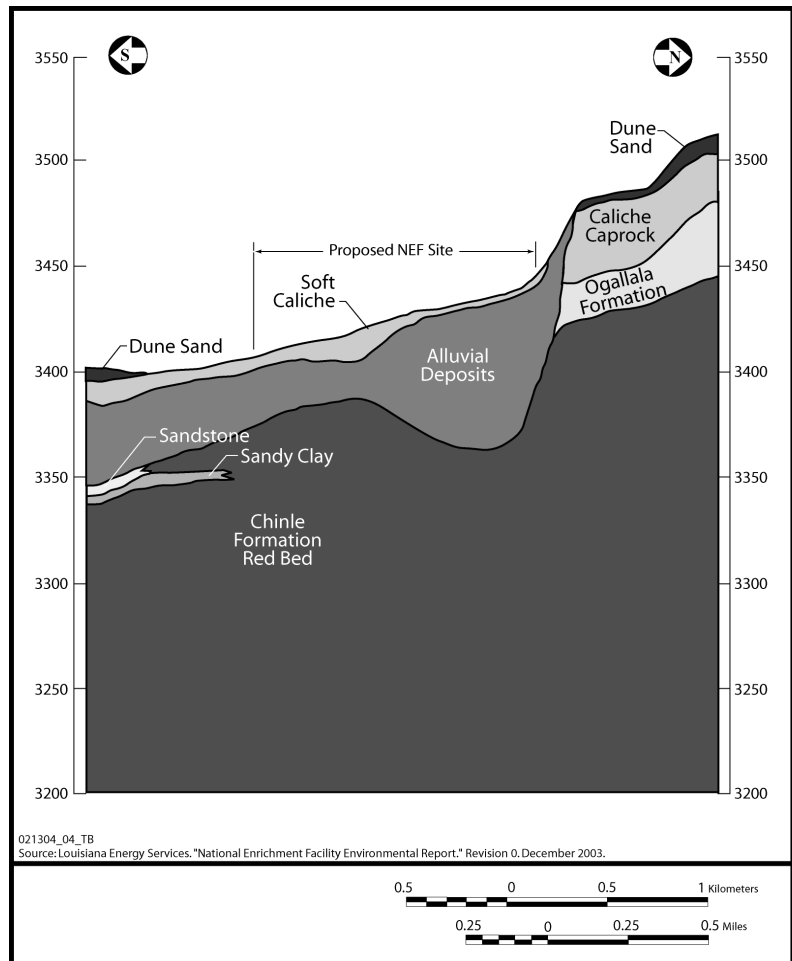


Figure 3-16 Geologic Units in the Proposed NEF Site Area (LES, 2004a)

3.6.1.1 Regional Earthquakes

The majority of earthquakes in the United States are located in the tectonically active western portion of the country. Most of New Mexico's historical seismicity has been concentrated in the Rio Grande Valley between Socorro and Albuquerque (USGS, 2003a). The southwestern portion of the United States tends to experience earthquakes at a lower rate and lower intensity. Earthquakes in the vicinity of the proposed NEF site include isolated, small clusters of low- to moderate-size events. A review of earthquake data collected for the site and vicinity indicates that the earthquakes that occurred near the proposed NEF site were likely induced by gas/oil recovery methods and were not tectonic in origin (NMBMMR, 1998). The Permian Basin region has produced billions of barrels of oil (Vertrees, 2002). No volcanic activity exists in the region surrounding the proposed NEF site.

3.6.1.2 Mineral Resources

No significant nonpetroleum mineral deposits are known to exist on the proposed NEF site. According to information collected by the New Mexico Bureau of Mines and Mineral Resources on behalf of the U.S. Geological Survey (USGS), the top nonpetroleum minerals in New Mexico are, by value, potash, copper, construction sand and gravel, crushed stone, and cement. Figure 3-17 shows the potential mineral resources in the State of New Mexico.

According to the New Mexico Bureau of Mines and Mineral Resources/USGS survey, there are suitable mineral resources in Lea County for the excavation of construction sand and gravel, crushed stone, and salt. There is also an area of Lea County that has a concentration of mineral operations for sulfur (USGS, 2001). An active sand and gravel quarry located to the north of the proposed NEF site is operated by Wallach Concrete, Inc.

3.6.2 Site Geology

Geologically, the proposed NEF site is located in an area where surface exposures consist mainly of Quaternary-aged eolian and piedmont sediments along the far eastern margin of the Pecos River Valley. Surface soils in the vicinity of the site are described as sandy alluvium with subordinate amounts of gravel, silt, and clay. Other surficial units in the site vicinity include caliche. These upper layers include tough slabby gypsiferous, which is subject to wind erosion.

Topographic relief on the site is generally subdued. Site elevations range between about +1,033 and +1,045 meters (+3,390 and +3,430 feet) above mean sea level, generally sloping to the south and southwest. Eolian processes resulted in a closed depression evident at the northern center of the site. Dune sand creates a topographic high at the southwest corner of the site. The dune sands, also known as the Brownsfield-Springer Association, are reddish-brown, fine to loamy-fine sands (USDA, 1974a).

The major geologic features underlying the site generally follow those of the region. The Gatuna and Antlers formations are sand and silty sand with sand and gravel at the base. A layer of caliche below this alluvium is present at some locations on the proposed NEF site. The formation directly beneath the alluvium is the Chinle Formation. The Santa Rosa Formation lies between the base of the Chinle formation and the top of the Permian. This formation includes sandy beds containing a ground-water aquifer. Table 3-8 shows the stratigraphy, including the depths and thicknesses, underlying the proposed NEF site.

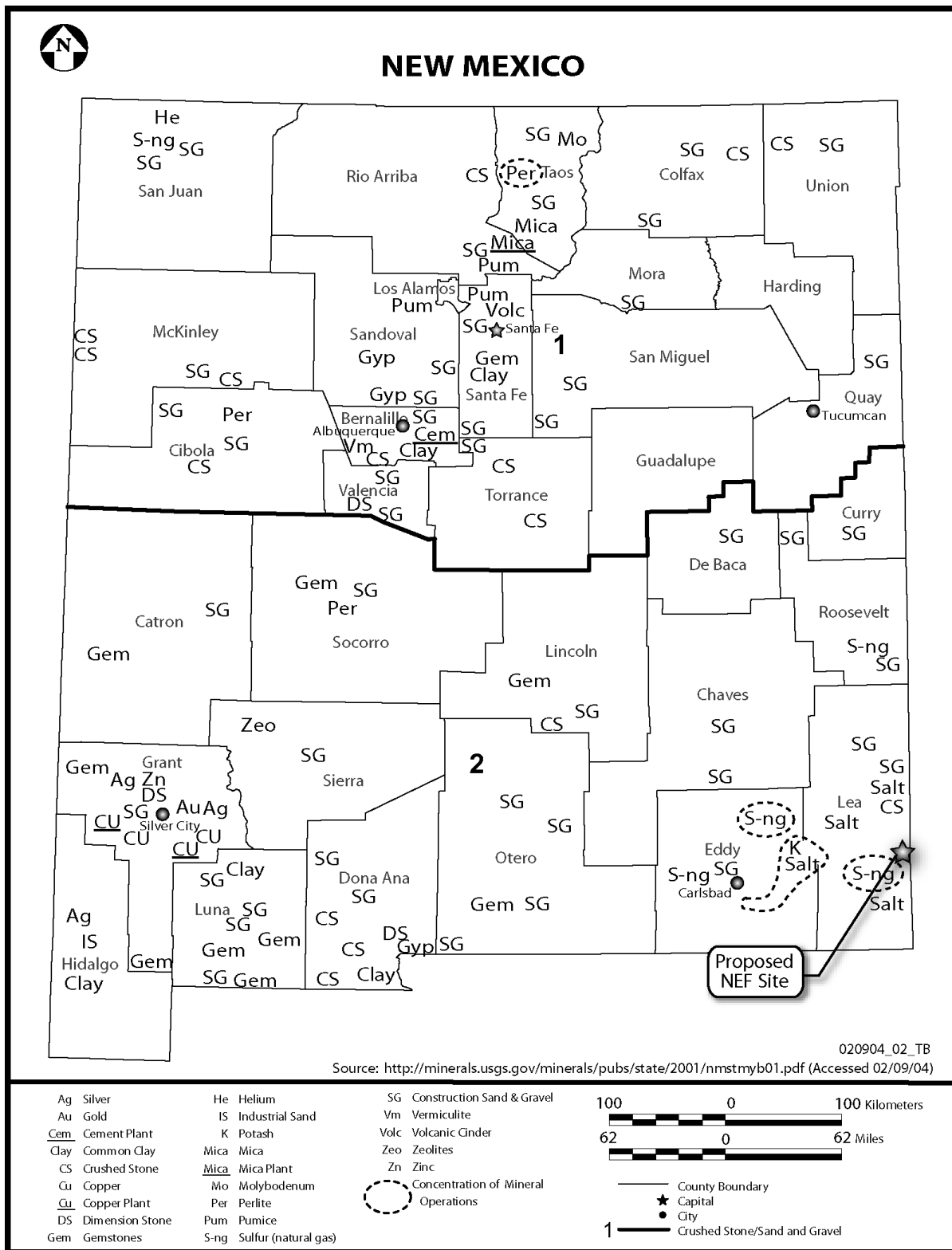


Figure 3-17 New Mexico Mineral Resources (USGS, 2004b)

Table 3-8 Geological Units Exposed at, near, or Underlying the Proposed NEF Site

Formation	Geologic Age	Descriptions	Estimates for the Proposed NEF Site Area ^a	
			Depths: meters (feet)	Thickness: meters (feet)
Topsoils	Recent	Silty fine sand with some fine roots—eolian	Range: 0 to 0.6 (0 to 2) Average (Top/Bottom): 0/0.4 (0/1.4)	Range: 0.3 to 0.6 (1 to 2) Average: 0.4 (1.4)
Mescalero Sands/Blackwater Draw Formation	Quaternary	Dune or dune-related sands	Range (sporadic across site): 0 to 3 (0 to 10) Average: N/A ^b	Range (sporadic across site): 0 to 3 (0 to 10) Average: N/A ^c
Gatuña/Antlers Formation	Pleistocene/mid-Pliocene	Pecos River Valley alluvium: Sand and silty sand with interbedded caliche near the surface and a sand and gravel base layer	Range: 0.3 to 17 (1 to 55) Average (Top/Bottom): 0.4/12 (1.4/39)	Range: 6.7 to 16 (22 to 54) Average: 12 (38)
Mescalero Caliche	Quaternary	Soft to hard calcium carbonate deposits	Range: 1.8 to 12 (6 to 40) Average (Top/Bottom): 3.7/8 (12/26)	Range: 0 to 6 (0 to 20) Average (all 14 borings) ^d : 1.4 (5) Average (five borings that encountered caliche): 4.3 (14)
Chinle Formation	Triassic	Claystone and silty clay: red beds	Range: 7 to 340 (23 to 1,115) Average (Top/Bottom): 12/340 (39/1,115)	Range: 323 to 333 (1,060 to 1,092) Average: 328 (1,076)
Santa Rosa Formation	Triassic	Sandy red beds, conglomerates, and shales	Range: 340 to 434 (1,115 to 1,425) Average: N/A ^b	Range: N/A ^e Average: 94 (310)
Dewey Lake Formation	Permian	Muddy sandstone and shale red beds	Range: 434 to 480 (1,425 to 1,575) Average: N/A ^b	Range: N/A ^e Average: 46 (150)

^a Range of depths is below ground level to shallowest top and deepest bottom of geological unit determined from site boring logs, unless noted. Average depths are below ground level to average top and average bottom of geological unit determined from site boring logs, unless noted. Range of thickness is from the smallest thickness to the largest thickness of geological unit determined from site boring logs, unless noted. Average thickness is the average as determined from site boring logs, unless noted. Bottom of Chinle Formation, top and bottom of Santa Rosa Formation, and top and bottom of Dewey Lake Formation are single values from a deep boring just south of the proposed NEF site.

^b Average depths are not available.

^c Average thickness is not available.

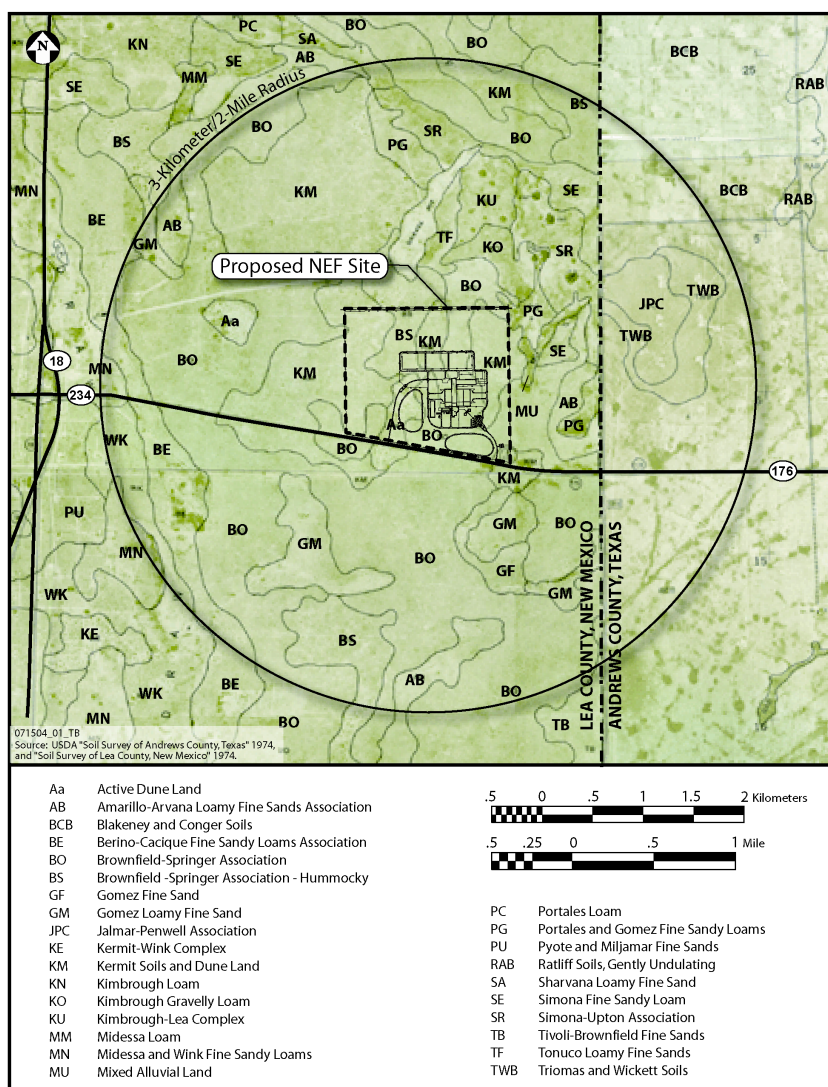
^d Caliche is not present at some locations of the site. Where not present in a particular boring, a thickness of '0' meter (feet) is used in calculating the average.

^e Range of thickness is not available.

Source: LES, 2004a; Nicholson and Clebsch, 1961.

3.6.3 Site Soils

Figure 3-18 presents a soil map of the proposed NEF site area. Geotechnical and site boring investigations confirm a thin layer of loose sand at the surface that overlies about 12 meters (40 feet) of alluvial silty sand, and sand and gravel cemented with caliche. Chinle Formation clay extends from about 12 meters (40 feet) below ground surface to a depth of approximately 340 meters (1,115 feet). The granular soils located in the uppermost 12 meters (40 feet) of the subsurface provide potentially high-quality bearing materials for building and heavy machine foundations. For extremely heavy or settlement-intolerant facilities, foundations can be constructed in the Chinle Formation, which has an unconfined compressive strength of over 195,000 kilograms per square meter (20 tons per square foot). The USDA soil survey indicates the proposed NEF site surface soils consist primarily of Dune Land, Kermit soils, and the Brownfield-Springer association (USDA, 1974a; 1974b). Soils associated with the Brownfield-Springer association, Kermit soils, and dune land are suitable for range, wildlife habitat, and recreational areas. On the western portion of the proposed NEF site in the vicinity of the sand dune



**Figure 3-18 Soil Map of the Proposed NEF Site Area
(USDA, 1974a; USDA, 1974b)**

buffer, soils are mapped as active dune land, which is made up of light-colored, loose sands. Sloping ranges from 5 to 12 percent or more. The surface of active dune land soil is typically bare except for a few shinnery oak shrubs.

3.6.4 Soil Radiological and Chemical Characteristics

LES conducted soil sampling at 10 random locations across the proposed NEF site (LES, 2004a). The soil was sampled for radioactive components including uranium, thorium, and their daughter products. Potassium-40, a naturally occurring radionuclide, and cesium-137, produced by past weapons testing, were also measured. Subsequent to this, LES performed an additional round of testing of both radionuclides and nonradionuclide chemicals. Six of the eight sites sampled in the latter round were selected to represent background conditions at proposed plant structures (e.g., the proposed basins and storage pads). The other two sites were representative of upgradient, onsite locations (LES, 2004a). Table 3-9 presents the results of the most recent measurements; the previous sampling measurements were consistent with these latest results.

Table 3-9 Chemical Analyses of Proposed NEF Site Soil

Radionuclides	Measured Concentration becquerels/kilogram (picocuries/kilogram)^{a, b}	Typical Soil Concentration^b becquerels/kilogram (picocuries/kilogram)
Potassium-40	138 ± 3 (3,730 ± 82)	130 (3,500)
Cesium-137	2.9 ± 0.9 (77 ± 24)	N/A
Actinium-228	6.5 ± 0.7 (176 ± 19)	8.1 (218)
Thorium-228	7.0 ± 1.0 (187 ± 26)	8.1 (218)
Thorium-230	5.8 ± 0.5 (158 ± 13)	N/A
Thorium-232	7.0 ± 0.6 (187 ± 17)	8.1 (218)
Uranium-234	6.0 ± 0.3 (161 ± 7.9)	12 (333)
Uranium-235	0.33 ± 0.08 (8.8 ± 2.2)	N/A
Uranium-238	5.9 ± 0.2 (158 ± 6.5)	12 (333)
Chemicals	Measured Concentration (milograms/kilogram)^a	New Mexico Soil Screening Level (milograms/kilogram)^c
Barium	23 ± 12	1,440
Chromium	3.6 ± 0.9	180
Lead	2.7 ± 0.3	400

N/A = not available.

^a Concentrations noted as average ± standard deviation.

^b LES, 2004a; NCRP, 1992.

^c NMEDHWB, 2004.

No nuclides other than those in the table were above minimum detectable concentrations in the laboratory. The measured radionuclides are all naturally occurring except for cesium-137, which is ubiquitous in the environment as a result of past atmospheric weapons testing. Chemicals analyzed for but not detected above minimum detectable concentrations include volatiles, semivolatiles, metals (arsenic, cadmium, mercury, selenium, and silver), organochlorine pesticides, organophosphorous

compounds, chlorinated herbicides, and fluoride. Only barium, chromium, and lead were detected above minimum detectable concentrations in the soil samples. These measured levels were orders of magnitude less than the New Mexico soil-screening concentrations. The soil-screening concentrations are intended to be levels below which there are no health concerns (NMEDHWB, 2004).

3.7 Surface Water

This section addresses the surface-water features at or near the proposed NEF site.

3.7.1 Surface Water Features in the Vicinity of the Proposed NEF Site

There are no surface-water bodies or surface-drainage features on the proposed NEF site (USGS, 1979). The site topography is relatively flat, ranging between about 1,033 and 1,045 meters (3,390 and 3,430 feet) above mean sea level, with an average slope of 0.0064 centimeter/centimeter (2.5 inches/ inches). Wind erosion has created localized depressions; however, these depressions are not large enough to have an impact on surface-water collection. The vegetation on the site is primarily shrubs and native grasses. The surface soils tend to hold moisture in storage rather than allow rapid infiltration to depth. Water held in storage in the soil is subsequently subject to evapotranspiration. The evapotranspiration processes are significant enough to severely limit potential ground-water recharge. Essentially all of the precipitation that occurs at the site is subject to infiltration and subsequent evapotranspiration. Net evaporation/transpiration is estimated as 65 inches/year (Reed and Associates, 1977). Figure 3-19 illustrates local topography in the area of the proposed NEF site.

The site is contained within the Monument Draw watershed; however, there are no freshwater lakes, estuaries, or oceans in the vicinity of the site. Local surface hydrologic features in the vicinity of the site include Monument Draw, Baker Spring, and several ponds on the Wallach Concrete, Inc., Sundance Services, Inc., and WCS properties. Monument Draw is an intermittent stream and the closest surface-water-conveyance feature to the proposed NEF site. Figure 3-20 shows the location of Monument Draw. While Monument Draw is typically dry, the maximum historical flow occurred on June 10, 1972, and measured 36.2 cubic meters per second (1,280 cubic feet per second).

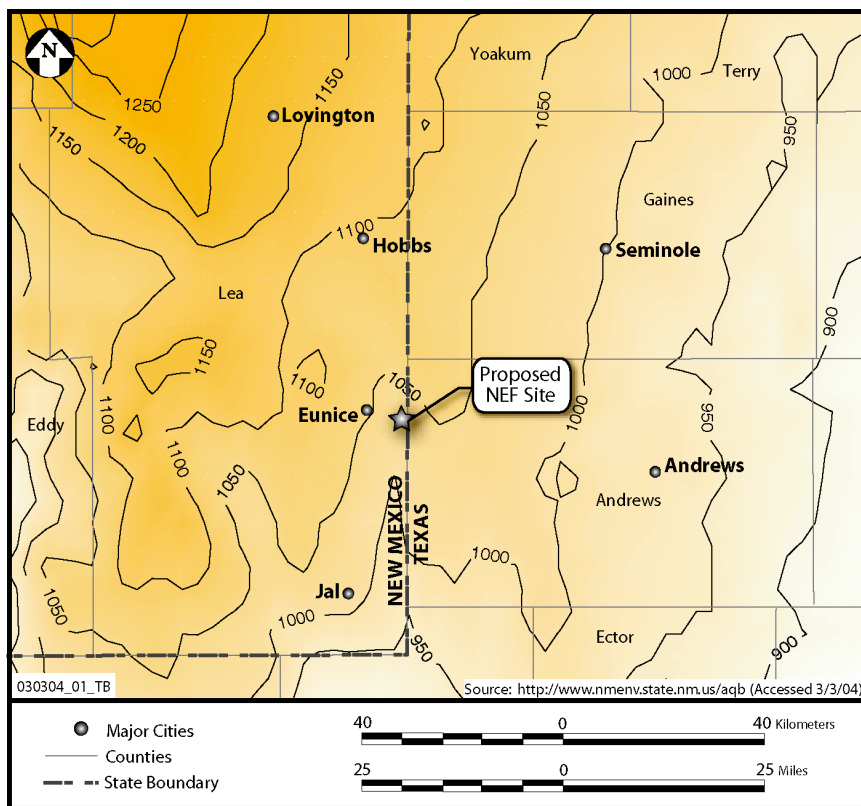


Figure 3-19 General Topography Around the Proposed NEF Site (NMAQB, 2004)

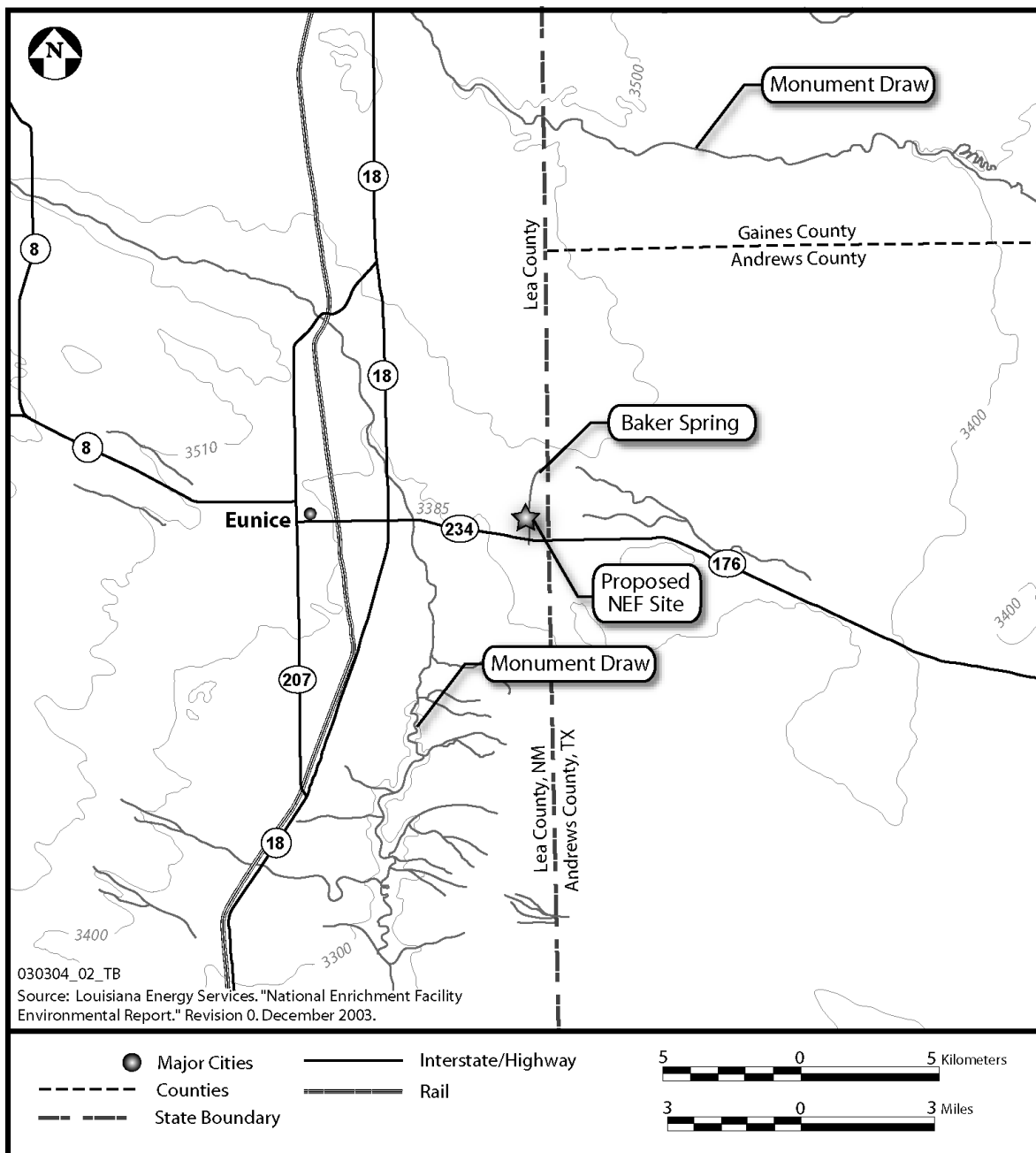


Figure 3-20 Regional Hydrologic Features (LES, 2004a)

Baker Spring is located to the northeast of the proposed NEF site at the edge of an escarpment where the caprock ends. Surface water is present in Baker Spring intermittently. The Baker Spring area is underlain by Chinle Formation clay, whose low permeability impedes deep infiltration of that water. Therefore, the intermittent localized flow and ponding of water in this area may be attributed to seepage and/or precipitation/runoff. LES conducted a pedestrian survey of the Baker Spring area and noted the presence of a surface engineering control or diversion berm just north of the Baker Spring area. Based on field observations, it appears that the berm was constructed to divert surface water from the north and

redirect the flow to the east of the Baker Spring area. Aerial photographs suggest that the sand and gravel reserves in this area have been excavated to the top of the red bed. These excavation activities have resulted in the Baker Spring area having a lower elevation than the natural drainage features, and the surface water that formerly flowed through the natural drainage features now ponds in Baker Spring. Because the excavation floor consists of very low permeability red-bed clay, limited vertical migration of the ponded water occurs. Shading from the high wall and trees that have flourished in the excavated area slow the natural evaporation rates, and water stands in the pond for extended periods of time. It is also suspected that during periods of ponding, surface water infiltrates into the sands at the base of the excavated wall and is retained as bank storage. As the surface-water level declines, the bank storage is discharged back to the excavation floor.

On the Wallach Concrete, Inc., property, a shallow surface depression is located at the base of one of the gravel pits. Water is perennially present in the pit due to a seep at the base of the sand and gravel unit at the top of the Chinle Formation clay. Wallach Concrete, Inc., occasionally pumps water out of this depression for use onsite; however, the amount of water in the depression is insufficient to fully supply the quarry operations. While the rate of replenishment has not been quantified, it appears to be relatively slow. This shallow zone of ground water is not observed throughout Wallach's property; therefore, it appears to be representative of a local perched water condition and is not considered to be an aquifer.

3.7.1.1 Wetlands

The proposed NEF site does not contain wetlands, freshwater streams, rivers, or lakes. No commercial and/or sport fisheries are located on the proposed NEF site or in the local area. The closest fishery is situated about 121 kilometers (75 miles) west of the site on the Pecos River near Carlsbad, New Mexico. No important aquatic ecological systems are onsite or in the local area that are vulnerable to change or contain important species habitats such as breeding and feeding areas. Relative regional significance of the aquatic habitat is low.

3.7.1.2 Flooding

The proposed NEF site is not located near any floodplains. The site grade is above the elevation of the 100-year and the 500-year flood elevations. There is no direct outfall to a surface water body on the site.

3.8 Ground-Water Resources

This section describes the ground-water resources and uses in the area that are available for the proposed NEF construction, operations, and decommissioning.

3.8.1 Site and Regional Hydrogeology

Because the climate in southeastern New Mexico is semi-arid, the onsite vegetation consists predominately of shrubs and native grasses. The surface soils are predominately of an alluvial or eolian origin. The near-surface soils are primarily silts and silty sands. These silty types of soils have relatively low permeability compared with sands and tend to hold moisture in storage rather than allow for rapid infiltration to deeper below the ground surface (DeWiest, 1969).

The top approximately 17 meters (56 feet) of soil are comprised of a silty sand, grading to a sand and gravel just above the red-bed-clay unit. The porosity of the surface soils is on the order of 25 to 50

percent, and the saturated hydraulic conductivity of the surface soils is likely to range from 10^{-5} to 10^{-1} centimeters per second (3.9×10^{-6} to 3.9×10^{-2} inches per second).

Field investigation and computer modeling were used to show that no precipitation recharge (i.e., rainfall seeping deeply into the ground) occurs in thick, desert vadose zones with desert vegetation (Walvoord et al., 2002). Precipitation that infiltrates into the subsurface is, instead, efficiently transpired by the native vegetation. Sites with thick vadose zones, such as the proposed NEF site, have a natural thermal gradient in the deeper part of the vadose zone that induces water vapor to diffuse upward toward the vegetation root zone. The water vapor creates a negative pressure potential at the base of the root zone that acts like a sink where water is taken up by the plants and transpired. Measurements in the High Plains of Texas, which indicated an upward hydraulic gradient in the upper 10-15 meters (33-49 feet) of the vadose zone, support this behavior (Walvoord et al., 2002).

Localized shallow ground-water occurrence exists to the east of the proposed NEF site on the WCS property and to the north on the Wallach Concrete, Inc., property. Several abandoned windmills are located on the WCS property. The windmills were used to supply water for stock tanks by tapping small saturated lenses above the Chinle Formation red beds. The amount of ground water in these zones is limited, and the source of recharge is likely to be "buffalo wallows" located near the windmills. The buffalo wallows are substantial surface depressions that collect surface-water runoff. Water collecting in these depressions is inferred to infiltrate below the root zone due to the ponding conditions. A subsurface investigation by WCS in the vicinity of the windmills found that when water was encountered in the sand and gravel above the Chinle Formation red beds, the water level was slow to recover following a sampling event. This slow recovery is attributed to the low permeability of the saturated zones and the high water storage in the overlying soils. The discontinuity of this saturated zone and its low permeability suggest that the ground water is representative of a perched water condition and not an aquifer.

Below this lies approximately 328 meters (1,076 feet) of Chinle Formation (red bed) clay with measured permeabilities in the range of 1×10^{-9} to 1×10^{-8} centimeters per second (3.9×10^{-10} to 3.9×10^{-9} inches per second). Moisture content in the Chinle Formation generally averages from 8 to 12 percent, with a dry density of the clay averaging 2.12 grams per cubic centimeter (132 pounds per cubic foot) (JHA, 1993). The Chinle Formation has a surface slope of approximately 0.02 centimeter per centimeter (0.02 inch per inch) towards the south-southwest under the proposed NEF site. It is thought that the Chinle Formation is exposed in a large excavation about 2 miles southeast of Monument Draw and at Custer Mountain (Nicholson and Clebsch, 1961). The presence of the thick Chinle Formation clay beneath the site isolates the deep and shallow hydrologic systems. Although the presence of fracture zones that can significantly increase vertical water transport through the Chinle Formation has not been precluded, the low measured permeabilities indicate the absence of such zones. Visual inspection of this clay has also shown that it is continuous, solid, and tight with few fracture planes (Rainwater, 1996).

Ground water occurring beneath the surface of the red-bed clay occurs at distinct and distant elevations. The most shallow of these occurs approximately 67 meters (220 feet) beneath the land surface, just below the surface of the red-bed unit. This siltstone or silty sandstone unit has low permeability and does not yield ground water readily. The permeability of this layer was measured in the field at the proposed NEF site as 3.7×10^{-6} centimeters per second (1.5×10^{-6} inches per second). The local gradient was 0.011 centimeter per centimeter (0.011 inch per inch) towards the south-southeast with a porosity estimated as 0.14.

There is also a 30.5-meter-thick (100-foot-thick) water-bearing sandstone layer at about 183 meters (600 feet) below ground surface. However, the first occurrence of a well-defined aquifer capable of producing significant volumes of water is the Santa Rosa Formation. This formation is located about 340 meters (1,115 feet) below ground surface (LES, 2004a). The Santa Rosa is recharged by precipitation on sand dunes in Lea County and Eddy County, New Mexico, and precipitation directly on outcrop areas (Nicholson and Clebsch, 1961). No local investigations of this aquifer were conducted due to the depth of the aquifer and the thickness and low permeability of the overlying Chinle Formation clay, which inhibits potential ground-water migration to the Santa Rosa. There is no indication of a hydraulic connection among the Chinle saturated horizons and the Santa Rosa Formation.

Ground-water velocities were estimated based on the above parameters for both the saturated siltstone unit in the red-bed clay and vertical travel through the clay. The velocity in the saturated siltstone unit within the clay is a slow 0.09 meters per year (0.3 feet per year) towards the south-southeast, reflecting the low permeability of this layer. Using the largest measured Chinle Formation permeability, vertical ground-water velocity through the clay is conservatively estimated as 0.04 meters per year (0.13 feet per year); the resulting travel time from the surface of the clay to its base (the top of the Santa Rosa Formation) would be greater than 8,000 years.

Figure 3-21 depicts the locations of borings on the proposed NEF site. Onsite borings include nine site ground-water exploration boreholes, the installation of three ground-water monitoring wells, and five geotechnical borings in the soil above the Chinle Formation. The nine borings were also to the top of the Chinle Formation ranging in depth from 10-18 meters (35-60 feet) (Cook-Joyce, 2003). No ground water was observed in any of the finished boreholes nor was ground water observed after allowing the boreholes to stand open for 24 hours. The cuttings taken from the boreholes were dry or contained only residual saturation. The dry nature of the soils from the boreholes indicates no recharge from the ground surface at the site.

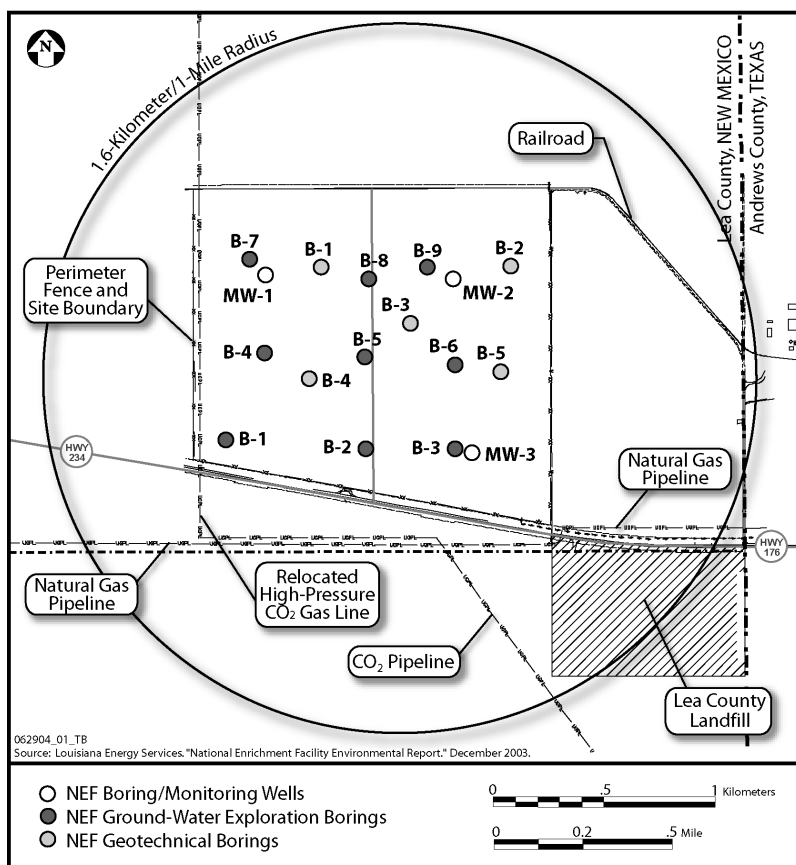


Figure 3-21 Borings on or near the Proposed NEF Site (LES, 2004a)

The three ground-water monitoring wells were installed in the uppermost water-bearing zone. This 4.5-meter-thick (15-foot-thick) pocket of water is within the Chinle Formation (red beds) at a depth of approximately 67 meters (220 feet) below ground level. Ground water was not observed in any of the

ground-water monitoring wells upon completion of the wells. One well (MW-2) did produce water after one month of monitoring, and the ground water in that well continued to recharge throughout the monitoring period.

3.8.2 Ground-Water Use

No surface water would be used from the proposed NEF site nor ground water from beneath the site. Instead, the proposed site would receive all of its water supply from the Eunice and/or Hobbs municipal water supply systems. No water wells are located within 1.6 kilometers (1 mile) of the site boundary.

The local municipalities obtain water from ground-water sources in the Ogallala Aquifer near the city of Hobbs, approximately 32 kilometers (20 miles) north of the site. The drinking water wells are positioned in the most productive portion of the Ogallala Formation in New Mexico where hydraulic conductivity approaches 70 meters per day (240 feet per day) (Woomer, 2004). Specific yields are between 0.1 and 0.28, and the saturated thickness is about 30 meters (90 feet) (LCWUA, 2003).

3.8.2.1 The Ogallala Aquifer

The Ogallala Aquifer, also known as the High Plains Aquifer, is a huge underground reservoir created millions of years ago that supplies water to the region which includes the proposed NEF site. The aquifer extends under the High Plains from west of the Mississippi River to the east of the Rocky Mountains. The aquifer system underlies 450,000 square kilometers (174,000 square miles) in parts of eight States (Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming). Figure 3-22 shows the Ogallala Aquifer and the proposed NEF site. Approximately 20 percent of the irrigated land in the United States is in the High Plains, and about 30 percent of the ground water used for irrigation in the United States is pumped from the Ogallala Aquifer. Irrigation accounts for about 94 percent of the daily aquifer use of more than 60 million cubic meters (16 billion gallons). Irrigation withdrawals in 1990 were greater than 53 million cubic meters (14 billion gallons) daily. Domestic drinking is the second largest ground-water use within the High Plains States, amounting to about 2.5 percent or 1.6 million cubic meters (418 million gallons) of total daily withdrawals (USGS, 2003b). In 1990, 2.2 million people were supplied by ground water from the Ogallala Aquifer with total public-supply withdrawals of 1.3 million cubic meters (332 million gallons) per day (USGS, 2004a). Withdrawals from the aquifer exceed recharge to it, and so the Ogallala Aquifer is considered a nonrenewable water source. The amount of water in storage in the aquifer in each State depends on the actual extent of the formation's saturated thickness.

The Ogallala Aquifer, the largest ground-water system in North America, contains approximately 4 trillion cubic meters (3.3 billion acre-feet) of water. About 65 percent of the Ogallala Aquifer's water is located under Nebraska (USGS, 2003b; RRAT, 2004); about 12 percent is located under Texas; about 10 percent is located under Kansas; about 4 percent is located under Colorado; and 3.5, 2, and 2 percent are located under Oklahoma, South Dakota, and Wyoming, respectively. The remaining 1.5 percent—or about 60 billion cubic meters (16 trillion gallons)—of the water is located under New Mexico (HPWD, 2004).

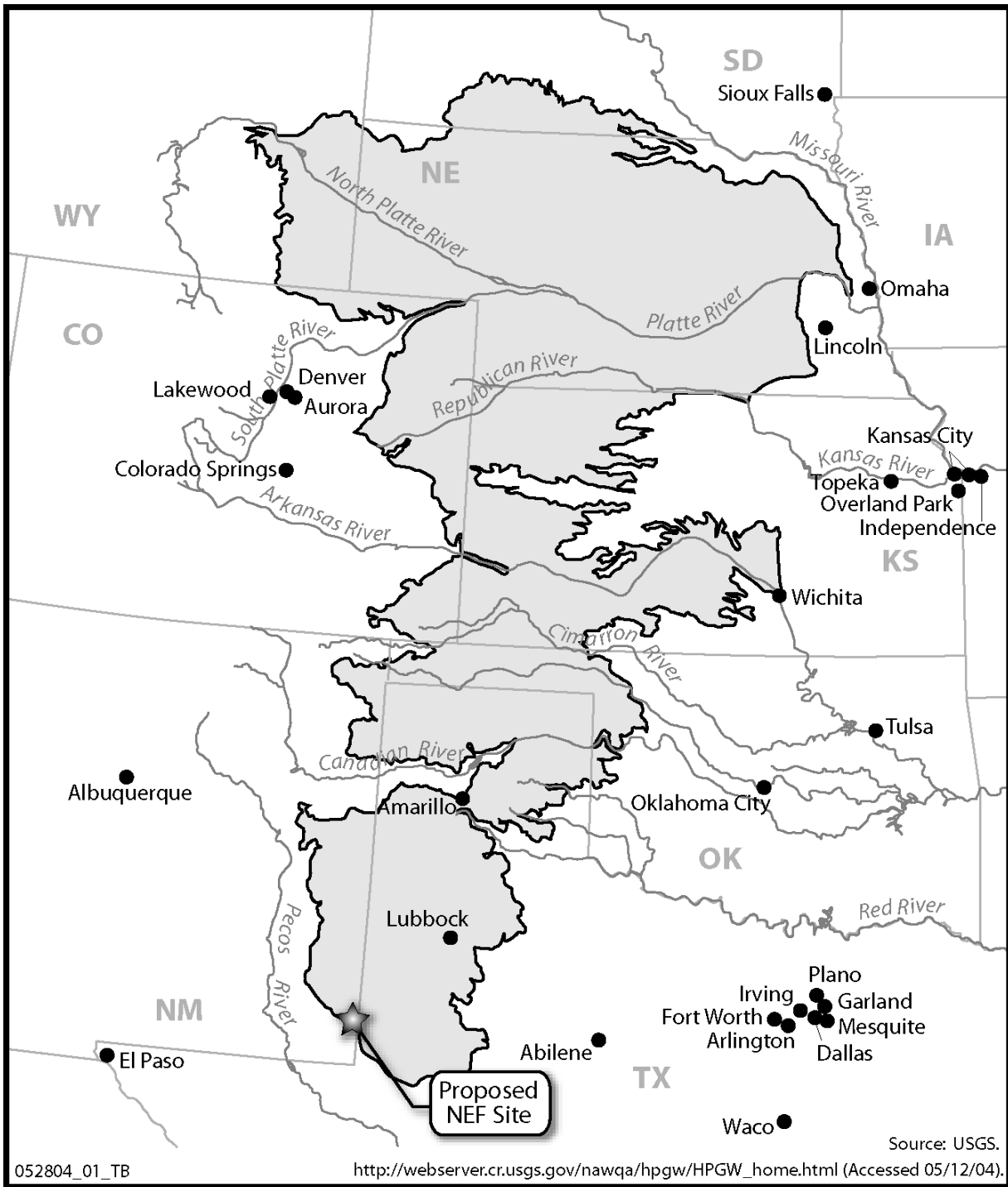


Figure 3-22 Ogallala Aquifer (USGS, 2004a)

3.8.2.2 Municipal Water Supply Systems

The Eunice and Hobbs, New Mexico, municipal water-supply systems have capacities of 16,350 cubic meters per day (4.32 million gallons per day) and 75,700 cubic meters per day (20 million gallons per day), respectively. Current usage of the Eunice and Hobbs municipal water-supply systems are 5,600 cubic meter per day (1.48 million gallons per day) and 29,678 cubic meters per day (7.84 million gallons per day), respectively (LCWUA, 2000). Figure 3-23 reflects the local water uses (withdrawals) for community water systems (including Eunice and Hobbs) in Lea County for the year 2000.

The Lea County Water Users Association report also estimated the year 2000 uses for the water that Lea County pumps from the Ogallala Aquifer. Irrigation uses for agricultural purposes was 69 percent of the total usage (LCWUA, 2003). Public water supply constitutes 8 percent of the ground-water uses. Hobbs and Lovington pump more than 70 percent of the water needs for Lea County. Other Lea communities, including Eunice, Jal, and Tatum, together account for only 17 percent. Carlsbad, an Eddy County community, pumps about 10 percent of the water from Lea County public water-supply sources (LCWUA, 2003).

The city of Eunice's residential use poses the single largest demand for water from the municipal system (LCWUA, 2003). Figure 3-24 shows that it accounts for 41 percent of the total demand, while sales to retailers make up the second largest demand. Figure 3-25 shows that the city of Hobbs produces similar

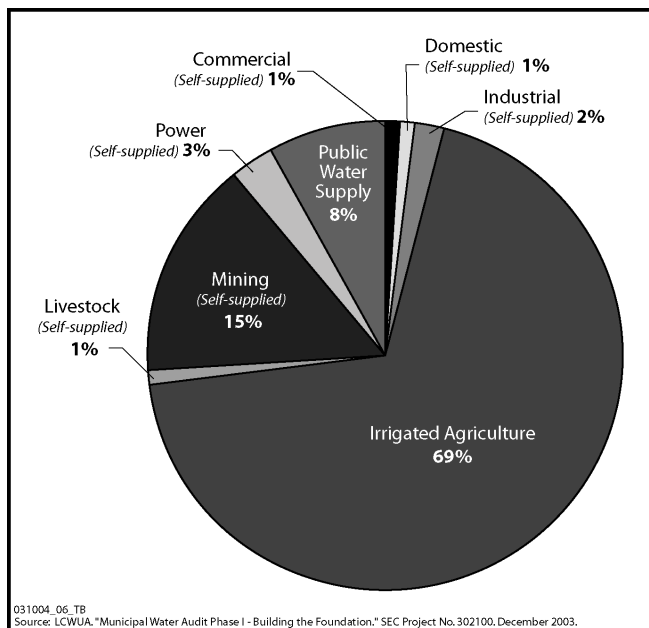


Figure 3-23 Lea County Water Use for 2000 (LCWUA, 2003)

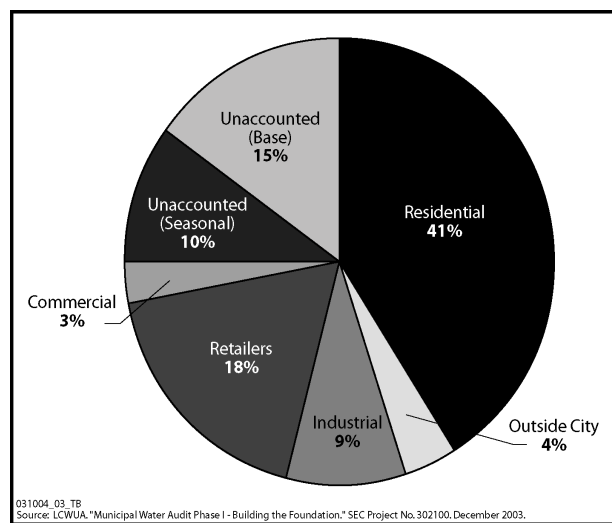


Figure 3-24 Eunice, New Mexico, Average Water Use for 2000-2002 (LCWUA, 2003)

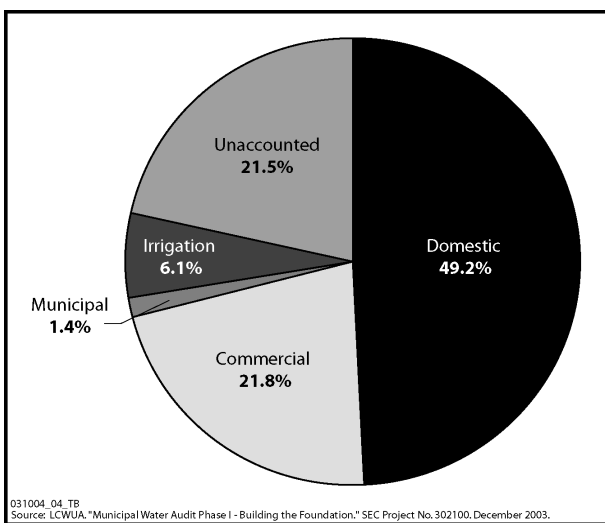


Figure 3-25 Hobbs, New Mexico, Average Water Use for 2000-2002 (LCWUA, 2003)

findings with residential (domestic) and commercial uses accounting for more than 70 percent of total water use (LCWUA, 2003).

Future regional demand for water would deplete Lea County's current water supply (LCWUA, 2003). County plans for increasing the water supply include conservation efforts and developing additional water supplies such as developing deeper aquifers (e.g., Santa Rosa Aquifer) and desalinization of saline waters. Model studies have shown that the Ogallala Aquifer may be completely dewatered in some areas by the year 2040 (LCWUA, 2003). In addition, the Lea County Water Users Association has drafted drought management plans (LCWUA, 2003) that include action levels denoted as Advisory, Alert, Warning, and Emergency with associated water-use actions ranging from voluntary reductions through allocation reductions of 20 (Warning) to 30 (Emergency) percent.

3.8.3 Ground-Water Quality

The waters of the Ogallala Aquifer, while very hard with a total dissolved solid content of less than 500 milligrams per liter, are consistently good quality and can be used for a variety of activities including public supply and irrigation (RRAT, 2004). The water in the southernmost region of the aquifer, mostly in Texas, is characterized by having higher levels of total dissolved solids that would exceed 1,000 milligrams per liter and in certain areas might reach 3,000 milligrams per liter. In this region, highly mineralized water in underlying rocks of marine origin seem to have invaded the aquifer. Increases of sodium and total dissolved solids contents may also be due to increased local industrial and irrigation practices (RRAT, 2004).

Table 3-10 lists recent water-quality testing results of local (Hobbs and Eunice) public water systems that obtain water from the Ogallala Aquifer. Total dissolved solids concentrations of 415 milligrams per liter are high but acceptable for various uses. Fluoride concentrations of 1.1 milligrams per liter are also high but acceptable. Chloride concentrations are moderate with concentrations up to 114 milligrams per liter, and sulfates are low ranging locally from 67 to 113 milligrams per liter (LCWUA, 2000).

The proposed NEF site has historically been used for cattle grazing. There is no documented history of manufacturing, storage, or significant use of hazardous chemicals on the property; therefore, there are no known previous activities that could have contributed to degradation of ground-water quality. To confirm this, LES installed nine soil boreholes and three monitoring wells as part of its ground-water investigation of the site. Of the three ground-water-monitoring wells installed on the site, only one has produced sufficient water to sample. This ground water, the first encountered below the site surface, was approximately 67 meters (220 feet) deep within a siltstone layer imbedded in the Chinle Formation clay. The ground water from this well was analyzed for standard inorganic compounds, volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, and radiological constituents.

Table 3-11 presents the results of the ground-water-quality sampling and testing program. Almost all of the elements tested were within the New Mexico regulatory limits and EPA maximum contaminant levels. Measurements of those elements which did not meet one standard or the other are highlighted in the table.

**Table 3-10 Ogallala Aquifer Annual Water Quality Averages
for Hobbs and Eunice, New Mexico**

Parameter	Units	Hobbs	Eunice	EPA Maximum Contaminant Levels*
Alkalinity—Total	mg/l	163 ^a	186.5	N/A
Color		not detected	0.25	250 ^g
Specific Conductivity	µmhos/cm	839.9	716.8	N/A
Hardness	mg/l	293.3	248	N/A
pH	standard	7.5	7.2	6.5 - 8.5
Turbidity	NTU	not detected	1.0	N/A
Total Dissolved Solids	mg/l	410.0	415.7	500 ^g
Arsenic	mg/l	0.008	0.008 ^d	0.01 (as of 1/3/06)
Calcium	mg/l	80.7	80.5	N/A
Chloride	mg/l	114.0	63.4	250 ^g
Fluoride	mg/l	1.1	1.0 ^e	4.0
Iron	mg/l	0.05	<0.25 ^f	0.3
Magnesium	mg/l	44.4	11.5	4.0
Mercury	mg/l	not detected	<0.0002 ^d	N/A
Nitrate	mg/l	3.8	2.6	10
Potassium	mg/l	3.4 ^a	4.8	
Sodium	mg/l	38.0	42.6	N/A
Sulfate	mg/l	113.1 ^b	67.2	
Gross Alpha	pCi/l	3.1 ± 0.9 to 16.6 ± 2.9 ^c	2.8 ± 1 to 6.6 ± 1 ^c	15

*EPA, 2004c.

N/A - not applicable; mg/l - milligrams per liter; NTU - Nephelometric Turbidity Units; pCi/l - picocuries per liter; µmhos/cm - micromhos per centimeter.

^a Sampled at entry point, August 23, 2004.

^b Sampled at entry point, February 1996.

^c Range in concentration, low and high; sampled from 1994 through 1997.

^d Sampled at entry point, March 1995.

^e Sampled at entry point, March 1996.

^f Samples taken from 1975 to 1979.

^g Results are either annual averages for all wells in a system, at the entry point of a system, or averages of all wells in a system for a particular sampling date.

Source: LCWUA, 2000.

Table 3-11 Chemical Analyses of Proposed NEF Site Ground Water

Parameter	Units	NEF Sample	Existing Regulatory Standards*	
			New Mexico	EPA Maximum Contaminant Levels
General Properties				
Total Dissolved Solids	mg/l	2,500	1,000	500 (a)
Total Suspended Solids	mg/l	6.2	NS	NS
Specific Conductivity	(µmhos/L)	6,800	NS	NS
Inorganic Constituents				
Aluminum	mg/l	0.480 (c)	5.0 (d)	0.05 – 0.2 (a)
Antimony	mg/l	<0.0036	NS	0.006
Arsenic	mg/l	<0.0049	0.1	0.01 (as of 1/3/06)
Barium	mg/l	0.021	1	2
Beryllium	mg/l	<0.00041	NS	0.004
Boron	mg/l	1.6	0.75 (d)	NS
Cadmium	mg/l	<0.00027	0.01	0.005
Chloride	mg/l	1600	250	250 (a)
Chromium	mg/l	0.043	0.05	0.1
Cobalt	mg/l	<0.00067	0.05 (d)	NS
Copper	mg/l	0.0086	NS	1.3 (b)
Cyanide	mg/l	<0.0039	0.2	0.2
Fluoride	mg/l	<0.5	1.6	4
Iron	mg/l	0.51	1	0.3 (a)
Lead	mg/l	<0.0021	0.05	0.015 (b)
Manganese	mg/l	1.0	0.2	0.05 (a)
Mercury	mg/l	<0.000054	0.002	0.002
Molybdenum	mg/l	0.04	1.0 (d)	NS
Nickel	mg/l	0.034	0.2 (d)	0.1
Nitrate	mg/l	<0.25	10	10
Nitrite	mg/l	<1	NS	1
Selenium	mg/l	<0.0046	0.05	0.05
Silver	mg/l	<0.0007	0.05	0.05
Sulfate	mg/l	2,200	600 (a)	250 (a)
Thallium	mg/l	<0.0081	NS	0.002
Zinc	mg/l	0.016	10	5 (a)
Radioactive Constituents				
Gross Alpha*	Bq/l	0.6	NS	0.6
	pCi/L	15.1		15

Parameter	Units	NEF Sample	Existing Regulatory Standards*	
			New Mexico	EPA Maximum Contaminant Levels
Gross Beta	Bq/L	1.2	NS	4 (mrem/yr)
	pCi/L	31.4		
Uranium			0.005	0.030
U-234	pCi/L	4.75		
	mg/L	0.00695	0.005	0.030
U-235	pCi/L	0.158		
	mg/L	0.000231	0.005	0.030
U-238	pCi/L	1.06		
	mg/L	0.001551	0.005	0.030

* The proposed standard excludes ²²²Rn, ²²⁶Ra, and uranium activity; New Mexico Standards (NMWQCC, 2002); EPA Maximum Contaminant Levels (EPA, 2004c).

Highlighted values exceed a regulatory standard.

NS - No standard or goal has been defined; mg/l - milligrams per liter; pCi/l - picocuries per liter; μmhos/cm - micromhos per centimeter.

(a): EPA Secondary Drinking Water Standard (EPA, 2004c)

(b): Action Level requiring treatment.

(c): Results of laboratory or field-contaminated sample.

(d): Crop irrigation standard.

Source: LES, 2004a.

3.9 Ecological Resources

This section describes the terrestrial and aquatic communities of the proposed NEF site and the associated plant and animal species. The interrelationships of these species are also discussed along with habitat requirements, life history, and population dynamics.

Ecological field surveys at the proposed NEF site were conducted in September 2003 (LES, 2004a), April 2004 (EEI, 2004a; LES, 2004a), and May 2004 (EEI, 2004b). These surveys focused on established empirical data for vegetation cover, mammals, birds, reptiles, and amphibians. A trapping or capture-and-release survey was not used during these initial surveys. Emphasis was placed on determining the habitats of candidate species that would occur at the proposed NEF site. In addition, Lea County conducted surveys in 1997 that covered the 350-acre (142-hectare) Lea County landfill located across from the proposed NEF site (LCSWA, 1998).

Due to the lack of suitable water-related habitat at the proposed NEF site, no waterfowl or water birds are currently found at the proposed NEF site. The lack of permanent water bodies at the site also results in the presence of few associated amphibian species. Therefore, no aquatic environment discussion is presented in this Draft EIS.

3.9.1 Fauna in the Vicinity of the Proposed Site

The proposed NEF site is located in an extensive deep sand environment. The area is a transitional zone between the short grass prairie of the Southern High Plains and the desert communities of the Chihuahuan Desert Scrub. It is dominated by deep-sand-tolerant or deep-sand-adapted plant species and is unique due to the dominance of the shinnery oak community.

The Plains Sand Scrub vegetation community at the proposed NEF site has remained stable since the introduction of domestic livestock grazing in the area by Spanish settlers. The site has not been impacted by farming or oil and gas development that is prevalent in the region.

The species composition of the wildlife at the site is reflective of the type, quality, and quantity of habitat present. Wildlife species at the proposed NEF site are those typical of species that occur in grassland and desert habitats. Table 3-12 lists the mammalian, bird, and amphibian/reptile species likely to be present at the site and vicinity, and presents information regarding their preferred habitats and probable distribution and abundance.

Table 3-12 Mammals, Birds, and Amphibians/Reptiles Potentially Inhabiting the Proposed NEF Site and Vicinity, and Their Habitat and Seasonal Preferences

Common Name	Scientific Name	
Mammals		Preferred Habitat
Black-Tailed Jackrabbit	<i>Lepus californicus</i>	Grasslands and open areas.
Black-Tailed Prairie Dog	<i>Cynomys ludovicianus</i>	Short grass prairie.
Cactus Mouse	<i>Peromyscus eremicus</i>	Grasslands, prairies, and mixed vegetation.
Collared Peccary	<i>Dicotyles tajacu</i>	Brushy, semi-desert, chaparral, mesquite, and oaks.
Coyote	<i>Canis latrans</i>	Open space, grasslands, and brush country.
Deer Mouse	<i>Peromyscus maniculatus</i>	Grasslands, prairies, and mixed vegetation.
Desert Cottontail	<i>Sylvilagus audubonii</i>	Arid lowlands, brushy cover, and valleys.
Mule Deer	<i>Odocoileus hemionus</i>	Desert shrubs, chaparral, and rocky uplands.
Ord's Kangaroo Rat	<i>Dipodomys ordii</i>	Hard desert soils.
Plains Pocket Gopher	<i>Geomys bursarius</i>	Deep soils of the plains.
Pronghorn Antelope	<i>Antilocapra americana</i>	Sagebrush flats, plains, and deserts.
Raccoon	<i>Procyon lotor</i>	Brushy, semi-desert, chaparral, and mesquite.
Southern Plains Woodrat	<i>Neotoma micropus</i>	Grasslands, prairies, and mixed vegetation.
Spotted Ground Squirrel	<i>Spermophilus spilosoma</i>	Brushy, semi-desert, chaparral, mesquite, and oaks.
Striped Skunk	<i>Mephitis mephitis</i>	All land habitats.
Swift Fox	<i>Vulpes velox</i>	Rangeland with short grasses and low shrub density.
White-Throated Woodrat	<i>Neotoma albigula</i>	Grasslands, prairies, and mixed vegetation.
Yellow-Faced Pocket Gopher	<i>Pappogeomys castanops</i>	Deep soils of the plains.

Common Name	Scientific Name	
<i>Birds</i>		<i>Seasonal Preference</i>
American Kestrel ^{*+}	<i>Falco sparverius</i>	Summer.
Ash-Throated Flycatcher ^{*+}	<i>Myiarchus cinerascens</i>	Summer.
Bewick's Wren ⁺	<i>Thyromanes bewickii</i>	Spring.
Black-Chinned Hummingbird	<i>Archilochus alexandri</i>	Year round.
Blue Grosbeak ⁺	<i>Guiraca caerulea</i>	Summer and winter.
Bullock's Oriole ⁺	<i>Icterus bullockii</i>	Summer.
Cassin's Sparrow ⁺	<i>Aimophila cassinii</i>	Spring.
Cactus Wren ⁺	<i>Campylorhynchus brunneicapillus</i>	Spring.
Chihuahuan Raven ^{*+}	<i>Corvus cryptoleucus</i>	Rare.
Common Raven	<i>Corvus corax</i>	Summer and winter.
Crissal Thrasher ⁺	<i>Toxostoma dorsale</i>	Summer and winter.
Eastern Meadowlark ⁺	<i>Sturnella magna</i>	Spring.
European Starling ⁺	<i>Sturnus vulgaris</i>	Spring.
Gambel's Quail	<i>Lophortyx gambelii</i>	Rare.
Great-Tailed Grackle ⁺	<i>Quiscalus mexicanus</i>	Spring.
Green-Tailed Towhee	<i>Pipilo chlorurus</i>	Migrant.
House Finch ^{*+}	<i>Carpodacus mexicanus</i>	Summer and winter.
Killdeer ⁺	<i>Charadrius vociferus</i>	Year round.
Lark Bunting ⁺	<i>Calamospiza melanocorys</i>	Winter.
Lark Sparrow ⁺	<i>Chondestes grammacus</i>	Summer.
Lesser Prairie Chicken	<i>Tympanuchus pallidicinctus</i>	Rare
Loggerhead Shrike ^{*+}	<i>Lanius ludovicianus</i>	Uncommon.
Long-Eared Owl	<i>Asio otus</i>	Summer and winter.
Mallard ⁺	<i>Anas platyrhynchos</i>	Summer.
Mourning Dove ^{*+}	<i>Zenaida macroura</i>	Summer and winter.
Nighthawk ⁺	<i>Chordeiles minor</i>	Summer and winter.
Northern Mockingbird ^{*+}	<i>Mimus polyglottos</i>	Summer.
Northern Bobwhite ⁺	<i>Colinus virginianus</i>	Summer and winter.
Pyrrhuloxia ⁺	<i>Cardinalis sinuatus</i>	Uncommon.
Red-Tailed Hawk	<i>Buteo jamaicensis</i>	Summer and winter.
Red-Winged Blackbird ⁺	<i>Agelaius phoeniceus</i>	Spring.

Common Name	Scientific Name	
Roadrunner	<i>Geococcyx californianus</i>	Summer and winter.
Sage Sparrow	<i>Amphispiza belli</i>	Summer and winter.
Scaled Quail ^{*+}	<i>Callipepla squamata</i>	Summer and winter.
Scissor-Tailed Flycatcher ⁺	<i>Tyrannus forficatus</i>	Migrant.
Scott's Oriole	<i>Icterus parisorum</i>	Summer and winter.
Swainson's Hawk ^{*+}	<i>Buteo swainsoni</i>	Summer.
Turkey Vulture	<i>Cathartes aura</i>	Winter migrant.
Vermilion Flycatcher	<i>Pyrocephalus rubinus</i>	Winter migrant.
Vesper Sparrow ⁺	<i>Pooecetes gramineus</i>	Spring.
Western Burrowing Owl	<i>Athene cunicularia hypugea</i>	Uncommon
Western Kingbird ⁺	<i>Tyrannus verticalis</i>	Summer.
Amphibians/Reptiles		Preferred Habitat
Coachwhip	<i>Masticophis flagellum</i>	Mixed grass prairie and desert grasslands.
Collared Lizard	<i>Crotaphytus collaris</i>	Desert grasslands.
Eastern Fence Lizard	<i>Sceloporus undulates</i>	Mixed grass prairie and desert grasslands.
Garter Snake	<i>Thamnophis Sp.</i>	Desert grasslands.
Ground Snake	<i>Sonora semiannulata</i>	Desert grasslands.
Longnose Leopard Lizard	<i>Gambelia wislizenii</i>	Mixed grass prairie and desert grasslands.
Lesser Earless Lizard	<i>Holbrookia maculata</i>	Mixed grass prairie and desert grasslands.
Longnosed Snake	<i>Rhinocheilus lecontei</i>	Desert grasslands.
Ornate Box Turtle	<i>Terrapene ornata</i>	Desert grasslands and short grass prairie.
Pine-Gopher Snake	<i>Pituophis melanoleucus</i>	Short grass prairie and desert grasslands.
Plains Blackhead Snake	<i>Tantilla nigriceps</i>	Short grass prairie and desert grasslands.
Plains Spadefoot Toad	<i>Spea bombifrons</i>	Shallow to standing pools of water.
Rattlesnakes	<i>Crotalus Sp.</i>	Short grass prairie and desert grasslands.
Sand Dune Lizard	<i>Sceloporus arenicolus</i>	Open sand and takes refuge under shinnery oak.
Six-Lined Racerunner	<i>Cnemidophorus sexlineatus</i>	Mixed grass prairie and desert grasslands.
Tiger Salamander	<i>Ambystoma tigrinum</i>	Tall-grass and mixed prairie.
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	Desert grasslands.
Western Whiptail Lizard	<i>Cnemidophorus tigris</i>	Mixed grass prairie and desert grasslands.

^{*} Species detected during the April 2004 survey (EEI, 2004a).

⁺ Species detected during the May 2004 survey (EEI, 2004b).

Source: LES, 2004a; EEI, 2004a, 2004b; LCSWA, 1998; WCS, 2004c.

3.9.1.1 Endangered and Threatened Species

The U.S. Fish and Wildlife Service (FWS) provided a list of endangered and threatened species, candidate species, and species of concern for Lea County (FWS, 2004a). Endangered species are any species which are in danger of extinction throughout all or a significant portion of its range. Threatened species are any species which are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. For Lea County, the black-footed ferret and northern aplomado falcon are listed as endangered, and the bald eagle is listed as threatened. Surveys did not identify these animals at or near the proposed NEF site.

3.9.1.2 Candidate Species

Candidate species are those that the FWS has sufficient information to propose that they be added to the Federal list of threatened and endangered species. Three of the species that are likely to occur at the proposed NEF site are on the candidate list: the lesser prairie chicken (*Tympanuchus pallidicinctus*), the sand dune lizard (*Sceloporus arenicolus*), and the black-tailed prairie dog (*Cynomys ludovicianus*).

The State of New Mexico has listed the sand dune lizard as a threatened species in Lea County (NMDGF, 2000). The black-tailed prairie dog and the lesser prairie chicken were listed as sensitive taxa in Lea County.

The three candidate species are described below.

Lesser Prairie Chicken

In the area of the proposed NEF site, the presence of a sand shinnery oak habitat would meet the requirements for suitable habitat for the lesser prairie chicken (NRCS, 2004). Figure 3-26 shows the male lesser prairie chicken. The area consists of prairie mixed shrub lands suitable for cover, food, water, and breeding areas (known as booming ground or leks). Two areas within Lea County have been nominated as an area of critical environmental concern for the lesser prairie chicken. One of these sites is located about 48 kilometers (30 miles) northwest of the site, and one is located further north. The nominations are under evaluation by the BLM (Johnson, 2000). The BLM plans to address this issue through an amendment to the Resource Management Plan in October 2004 (BLM, 2004).



Figure 3-26 Male Lesser Prairie Chicken (FWS, 2004b)

The nearest known breeding area for the lesser prairie chicken is located about 6.4 kilometers (4 miles) north of the site (LES, 2004a). A field survey conducted in the fall of 2003 at the proposed NEF site did not locate any lesser prairie chickens (LES, 2004a). A subsequent field survey in the spring of 2004 confirmed that the lesser prairie chicken habitat at the proposed site is of moderate quality and is limited to a small area. The study highlighted the fact that the eastern portion of the site harbors dense mesquite, and the western portion is dominated by shinoak-grassland communities and short grass prairie that provide unfavorable habitats to the lesser prairie chicken. Water distribution can be a limiting factor for

the lesser prairie chicken habitat in southeastern New Mexico. The proposed NEF site contains suitable food sources, but there are limited existing water sources onsite (Johnson, 2000).

Sand Dune Lizard

Sand dune lizards (Figure 3-27) only occur in areas with open sand, but they forage and take refuge under shinnery oak (NMDGF, 1996). They are restricted to areas where sand dune blowouts, topographic relief, or shinnery oak occur. They are seldom more than 1.2 to 1.8 meters (4 to 6 feet) from the nearest plant. The sand dune lizard feeds on insects such as ants, crickets, grasshoppers, beetles, spiders, ticks, and other arthropods. Feeding appears to take place within or immediately adjacent to patches of vegetation.



Figure 3-27 Sand Dune Lizard (CBD, 2003)

The proposed NEF site contains areas of sand dunes in the eastern central area of the site, southwestern quadrant, and a small area in the northwestern corner. Two surveys of the site did not identify favorable sand dune lizard habitats (Sias, 2003; Sias, 2004). The surveys indicated that the vegetation substrate at the proposed NEF site reflects conditions that would not support sand dune lizards. The dominance of the mesquite and grassland combinations at the site are not conducive environmental conditions for this species. The closest sand dune lizard population occurs about 5 kilometers (3 miles) north of the proposed NEF site (Sias, 2004).

Black-Tailed Prairie Dog

The black-tailed prairie dog (Figure 3-28) is a close cousin of the ground squirrel. A heavy-bodied rodent with a black-tipped tail, the black-tailed prairie dog is native to short-grass prairie habitats of western North America where they play an important role in the prairie ecosystem. They serve as a food source for many predators and leave vacant burrows for the burrowing owl, the black-footed ferret, the Texas horned lizard, rabbits, hares, and even rattlesnakes. Black-tailed prairie dogs avoid brush and tall-grass areas due to the reduced visibility these habitats impose. In Texas, they may be found in western portions of the State and in the Panhandle.

At one time, Texas reported huge prairie dog towns, such as one that covered 25,000 square miles and supported a population of about 400 million prairie dogs. Although prairie dog towns are still present in Texas, their current populations has been significantly reduced due to extensive loss of habitat during the last century.



Figure 3-28 Black-Tailed Prairie Dog (USGS, 2004c)

Black-tailed prairie dogs depend on grass as their dominant food source and usually establish colonies in short-grass vegetation types that allow them to see and escape predators. Plains-mesa sand scrub, the predominant vegetation type on the proposed NEF site, is not optimal black-tailed prairie dog habitat due to the high density of shrubs (LES, 2004a). There have been no sightings of black-tailed prairie dogs, no active or inactive prairie dog mounds/burrows, or any other evidence of prairie dogs at the proposed NEF site.

3.9.1.3 Species of Concern

The proposed site was also examined for suitable habitats that would be attractive to the listed Species of Concern in the State of New Mexico (FWS, 2004a). Species of concern are species for which further biological research and field study are needed to resolve their conservation status or which are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. The Species of Concern for the proposed NEF site are the swift fox (*Vulpes velox*), the American peregrine falcon (*Falco peregrinus anatum*), the arctic peregrine falcon (*Falco peregrinus tundrius*), the Baird's sparrow (*Ammodramus bairdii*), the Bell's vireo (*Vireo bellii*), the western burrowing owl (*Athene cunicularia hypugea*), and the yellow-billed cuckoo (*Coccyzus americanus*). The swift fox is a species of concern for Lea County under the Federal listing and is listed as a sensitive species under the State of New Mexico classification (FWS, 2004b; NMDGF, 2000).

The examination of the habitats indicates the proposed NEF site has the potential to attract the swift fox and the western burrowing owl. Given the availability of neighboring open land in the immediate area of the proposed NEF site and the low population density of the swift fox, the proposed NEF site is marginally attractive to the swift fox. The western burrowing owl requires burrows (natural or human-constructed) for nesting such as the rip raps lining ditches and ponds. If there are burrowing mammals such as prairie dogs (which are not likely to occur) or badgers in the area, then it is likely that the area may be attractive to burrowing owls.

3.9.2 Flora in the Vicinity of the Proposed Site

The vegetation community on the proposed NEF site is classified as plains sand scrub. The dominant shrub species associated with this classification is Shinoak (*Quercus havardii*) with lesser amounts of sand sage (*Artemisia filifolia*), honey mesquite (*Prosopis glandulosa*), and soapweed yucca (*Yucca glauca*). The community is further characterized by the presence of forbs, shrubs, and grasses that are adapted to the deep sand environment that occurs in parts of southeastern New Mexico (NRCS, 1978).

The dominant perennial grass species is red lovegrass (*Eragrostis oxylepis*). Other grasses include dropseed (*Sporobolus Sp.*) and purple three awn (*Aristida purpurea*), which are present in a lesser degree.

The total vegetative cover for the proposed NEF site is approximately 26.5 percent. Herbaceous plants cover about 16.7 percent of the total ground area, and shrubs cover approximately 9.6 percent of the total ground area. Perennial grasses account for 63.1 percent of the relative cover, shrubs account for 36.1 percent, and forbs account for 0.8 percent. The relative cover is the fraction of total vegetative cover that is composed of a certain species or category of plants.

Total shrub density for the proposed NEF site is 16,660 individuals per hectare (6,748 individuals per acre). The most abundant shrubs are shinoak with 14,040 individuals per hectare (5,688 individuals per

acre), followed by the soapweed yucca with 1,497 individuals per hectare (606 individuals per acre), and then the sand sage with 842 individuals per hectare (341 individuals per acre).

3.9.3 Pre-Existing Environmental Stresses

There are no onsite important ecological systems that are vulnerable to change or that contain important species habitats such as breeding areas, nursery, feeding, resting, and wintering areas, or other areas of seasonally high concentrations of individuals of candidate species or species of concern. The candidate species that have the potential to be present at the site are all highly mobile with the exception of the sand dune lizard. Ecological studies indicate, however, the absence of habitats for these species at the proposed NEF site (LES, 2004a; LES, 2004b; EEI, 2004a; EEI, 2004b; Sias, 2004). The vegetation type covering the proposed NEF site is not unique to that site and covers thousands of acres in southeastern New Mexico.

Past and present cattle grazing, fencing, and the maintenance of access roads and pipeline right-of-ways represent the primary preexisting environmental stress on the wildlife community of the site. The colonization of the disturbed areas by local plant species has alleviated the impact of pipeline installation and maintenance of pipeline right-of-ways. Disturbed areas immediately adjacent to the road, however, are being invaded by weeds. The proposed NEF site has large stands of mesquite indicative of long-term grazing pressure that has changed the vegetative community dominated by climax grasses to a sand scrub community and the resulting changes in wildlife habitat. Changes in local climatic and precipitation patterns are also an environmental stress for the southeastern New Mexico area.

Past and current uses of the proposed NEF site have most likely resulted in a shift from wildlife species associated with mature desert grassland to those associated with grassland shrub communities. Examples of this include a decrease in the pronghorn antelope, a species requiring large, open prairie areas, and an increase in species that thrive in a midsuccessional plant community like the black-tailed jackrabbit and the mule deer. Other environmental stresses on the terrestrial wildlife community, such as disease and chemical pollutants, have not been identified at the proposed NEF site.

3.10 Socioeconomic and Local Community Services

The socioeconomic characteristics for the 120-kilometer (75-mile) region of influence surrounding the proposed NEF site include Lea County, New Mexico, and Andrews County and Gaines County, Texas, as well as portions of Eddy County, New Mexico, and Ector, Loving, Winkler, and Yoakum Counties, Texas.

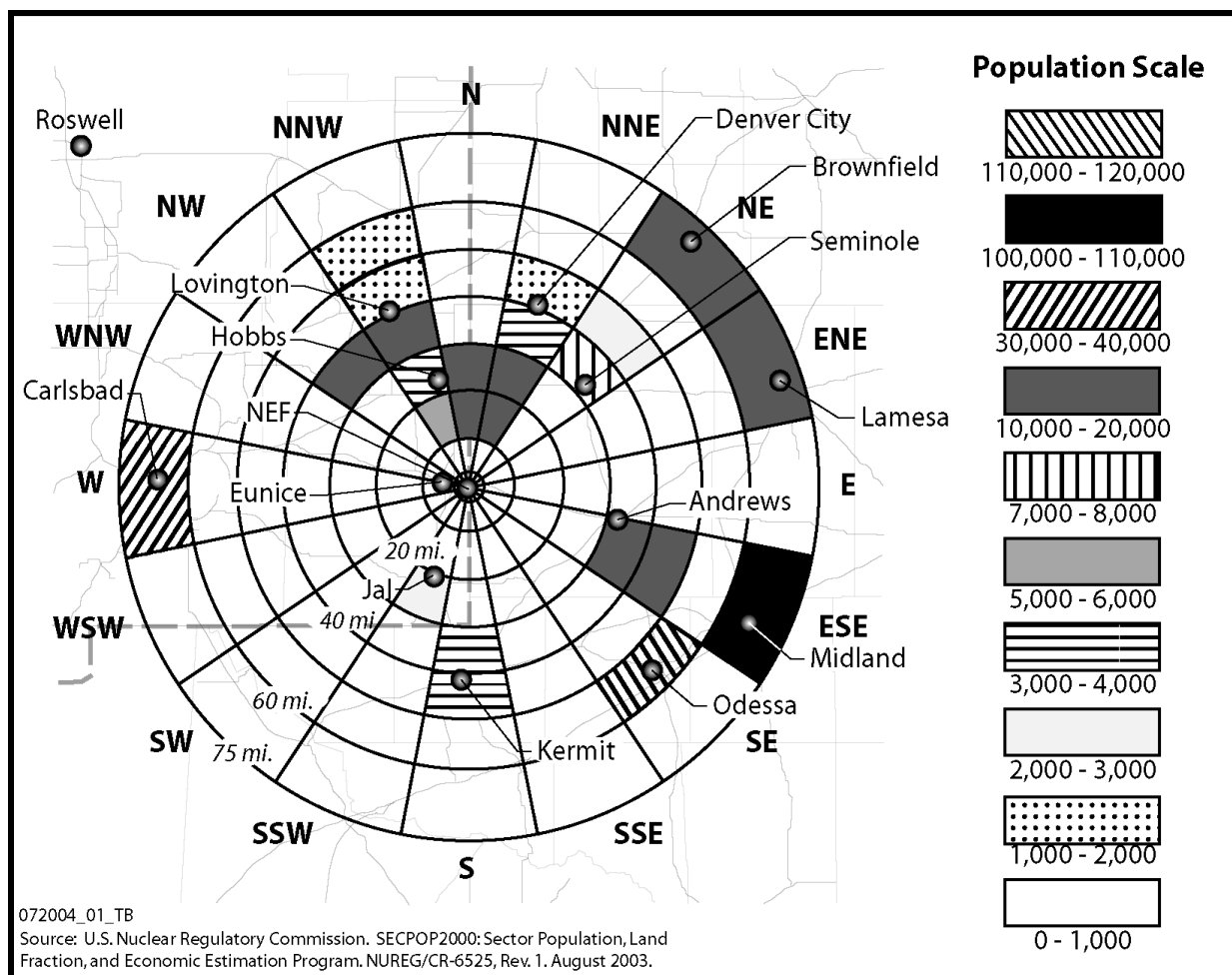
Established in March 1917, Lea County covers approximately 11,350 square kilometers (4,383 square miles). Its county seat, Lovington, is located 64 kilometers (39 miles) north-northwest of the proposed NEF site. The largest city in the county is Hobbs, and it is situated 32 kilometers (20 miles) to the north. Other incorporated communities in Lea County are Jal, 37 kilometers (23 miles) to the south; Eunice, 8 kilometers (5 miles) to the west; and Tatum, 72 kilometers (45 miles) to the north-northwest.

Due east of the proposed NEF site is Andrews County, Texas. Organized in 1910, Andrews County has a land area of 3,890 square kilometers (1,501 square miles). The county seat, city of Andrews, is 51 kilometers (32 miles) east-southeast of the proposed NEF site and is the only incorporated community in the county. There are no other major communities in Andrews County.

Northeast of the proposed NEF site is Gaines County, Texas, which was organized in 1905. Gaines County is approximately the same size as Andrews County (3,892 square kilometers (1,503 square miles)). The county seat is Seminole, and it is located 51 kilometers (32 miles) to the northeast (Coward, 1974).

The majority of the impacts are expected to occur in Lea County, given its larger population and workers living in closer proximity to the proposed NEF site and, to a lesser extent, in Andrews and Gaines Counties, Texas. Portions of Eddy County, New Mexico, and Ector, Loving, Winkler, and Yoakum Counties, Texas, are within the region of influence but are not expected to be impacted to any great extent. Figure 3-29 shows the population density surrounding the proposed NEF site.

Figure 3-1 shows the major communities and transportation routes in the region of influence. The remainder of this section presents information and data for population, housing, and education; employment and income; community services, infrastructure, and finances; utilities; waste disposal; and tax structure and distribution.



**Figure 3-29 Population Density Surrounding the Proposed NEF Site
(NRC, 2003b)**

3.10.1 Population, Housing, and Education

In 2000, the population of Lea County was approximately 55,511 with slightly more than half (28,660) living in Hobbs. The county seat, Lovington, had a population of 9,470. The other three incorporated communities in the county had a combined population of 5,240. About 22 percent of the county population lives in the unincorporated areas. Overall, the county has a population density of 4.9 people per square kilometer (12.76 square miles) (USCB, 2004). As shown in Table 3-13, the population of Lea County declined by about 1 percent between 1980 and 2000. This decline is in sharp contrast to the State of New Mexico, whose population increased by more than a half million people—or by nearly 40 percent—over the same period. Table 3-13 does not show the rapid increase in population that occurred in the early 1980's followed by a more gradual decrease during the remainder of the decade because the table presents an average over the decade and not annual changes. Beginning in the late 1970's, the population of Lea County expanded by 10,000 residents reaching a peak of more than 66,000 by the end of 1983. This population growth and decline was due to the expansion and contraction of the oil industry. From 1985 to 1990, the county lost population as oil prices stabilized and subsequently fell.

Andrews County is the 151st largest of the 254 counties in Texas. According to the U.S. Census Bureau, the population of Andrews County was 13,004 in 2000 with a population density of 3.3 people per square kilometer (8.7 square miles) (USCB, 2004). Its population experienced a similar growth/decline pattern as that of Lea County. The population of Gaines County in 2000 was 14,467. Unlike in Andrews County, the population of Gaines County was relatively stable during the 1990's. The total population of the three principal counties in the region of influence was nearly 83,000 in 2000. The area did not experience the population increases that occurred in other areas of New Mexico and Texas.

Table 3-13 shows that population growth in Lea County is projected to decline through the remainder of the decade (BBER, 2002). This is in contrast to Andrews County and Gaines County, where the population is expected to increase by 8.3 and 12.5 percent, respectively, between 2000 and 2010 (WSG, 2004). For the region of influence as a whole, the population is projected to remain stable throughout the decade. Both New Mexico and Texas are expected to continue to experience high population growth rates. As shown earlier, there are no significant populations within 24 kilometers (15 miles) of the proposed NEF with the exception of the city of Eunice 8 kilometers (5 miles) due west. Figure 3-1 shows the town of Hobbs due north of the site and Lovington further away in the north-northwestern direction. Between 24 and 48 kilometers (15 and 30 miles) south-southwest of the proposed site is a concentration of about 2,000-3,000 people that includes the community of Jal. East-southeast between 48 and 80 kilometers (30 and 50 miles) away from the proposed NEF is the city of Andrews and surrounding area with a population concentration of 12,000 to 14,000 people. The two major population concentrations in Gaines County— Seminole and Denver City—are northeast of the proposed NEF site.

Table 3-14 shows that the housing density in Lea County is 2.0 units per square kilometer (5.3 units per square mile), and the median cost of a home is \$50,100. The New Mexico State average housing density is 2.5 units per square kilometer (6.4 units per square mile), and the median cost of a home is \$108,000. In Andrews and Gaines counties, the housing units density is 1.4 units per square kilometer (3.6 units per square mile). The median cost of a home in Andrews and Gaines Counties is \$42,500 and \$48,000, respectively. The Texas State average housing density is 12 units per square kilometer (31.2 units per square mile), and the median cost of a home is \$82,500. The variation in housing between the counties and the State averages is reflective of the rural nature of the county areas. The percentage of vacant housing units is 15.8 percent for Lea County, 14.8 percent for Andrews County, and 13.5 percent for Gaines County. This compares to a housing vacancy of 13.1 percent in New Mexico and 9 percent in Texas.

Table 3-13 Baseline Values for Population and Growth in the Region of Influence

County	Population					
	1980	1990	2000	2010	2020	2030
Lea County, New Mexico	55,993	55,765	55,511	54,551	52,556	49,417
Andrews County, Texas	13,323	14,338	13,004	14,083	14,704	14,923
Gaines County, Texas	13,150	14,123	14,467	16,273	17,852	18,894
Region of Influence	82,466	84,226	82,982	84,907	85,112	83,234
New Mexico Total	1,303,303	1,515,069	1,819,046	2,112,957	2,382,999	2,626,333
Texas Total	14,225,512	16,986,335	20,851,820	24,395,179	27,917,492	31,197,014

County	Percent Decade Change					
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	
Lea County, New Mexico	--	-0.4	-0.5	-1.7	-3.7	-6.0
Andrews County, Texas	--	7.6	-9.3	8.3	4.4	1.5
Gaines County, Texas	--	7.4	2.4	12.5	9.7	5.8
Region of Influence	--	1.1	-2.3	0.2	-2.0	-4.3
New Mexico Total	--	16.3	20.1	16.2	12.8	10.2
Texas Total	--	19.4	22.8	17.0	14.4	11.7

Sources: USCB, 2002a; USCB, 2002b; BBER, 2002; Fedstats, 2004; WSG, 2004.

The population surrounding the proposed NEF site generally has a lower level of educational attainment than the State averages. Table 3-14 summarizes the school enrollment and educational attainment data for the three principal counties. These counties have approximately the same proportion of their residents in primary and secondary grades, and a significantly smaller proportion attending college than averages for New Mexico and Texas (WSG, 2004).

3.10.2 Employment and Income

In 2000, the labor force was nearly 33,573 (Lea County – 22,286, Andrews County – 5,511, and Gaines County – 5,776). The unemployment rate was 9.1 percent in Lea County and 8.1 percent in Andrews County. In Gaines County, the unemployment rate was less at 5.5 percent. For these counties, unemployment was higher than their State averages.

Table 3-14 Demographic, Housing, and Education Characteristics in the Region of Influence

Subject	Lea County	Andrews County	Gaines County	Region of Influence	New Mexico Total	Texas Total
<i>Demographics (Year 2000)</i>						
Total Population	55,511	13,004	14,467	82,982	1,819,046	20,851,820
<i>Housing Characteristics (Year 2000)</i>						
Total Housing Units	23,405	5,400	5,410	34,215	780,579	8,157,575
Occupied Units	19,699	4,601	4,681	28,981	677,971	7,393,354
Land Area	4,383	1,501	1,503	7,387	121,356	261,797
Housing Density (units per square mile)	5.3	3.6	3.6	4.6	6.4	31.2
Median Value (Year 2000 \$)	\$50,100	\$42,500	\$48,000	\$48,570	\$108,100	\$82,500
<i>Educational Characteristics (Year 2000)</i>						
School Enrollment	16,534	3,864	4,369	24,767	533,786	5,948,260
Grades <8	48.4%	51.0%	57.8%	50.4%	55.2%	58.0%
Grades 9-12	25.5%	30.3%	25.1%	26.2%	22.3%	21.9%
College	16.7%	8.6%	6.1%	13.6%	22.5%	20.2%
Educational Attainment (>25 years age)	33,291	7,815	8,006	49,112	1,134,801	12,790,893
High School Graduate	67.1%	68.0%	56.2%	65.4%	78.9%	75.7%
Bachelor's Degree or Higher	11.6%	12.4%	10.5%	11.6%	23.5%	23.2%

Source: USCB, 2002a; USCB, 2002b.

Table 3-15 shows the employment and income for the region of influence. Petroleum production, processing, and distribution (which falls under Agriculture, Forestry, Fishing, and Mining in Table 3-15) and agriculture are the dominant industries in the surrounding area. Associated with this sector are various support services including machining and tooling, chemical production, specialty construction, metal fabrication, and transportation and handling. Approximately 21.5 percent of the jobs are classified in these industries. This percentage compares to 4 percent and 2.7 percent in New Mexico and Texas, respectively. The percentage of the labor force in professional, scientific, and management-related occupations in these counties is about half of the labor force for New Mexico and Texas. Other sectors are similar to State averages.

In the early 1980's, the median household incomes for Lea County, Andrews County, and Gaines County exceeded the median income for New Mexico and Texas as a whole. Since then, the median household income in both counties has fallen considerably below that of the State averages. The decline in income

to levels below State averages is due to a shift in employment from relatively high-paying jobs in the oil and gas industry to lower paying jobs in the service sector. In 2000, per capita income ranged from \$13,088 in Gaines County to \$15,916 in Andrews County. Per capita income is about \$3,100 per year less than the State average in Lea County and \$3,700 per year less in Andrews County. In Gaines County, the per capita income is more than \$6,500 lower than the State average. The median household income is \$29,799 for Lea County, \$34,036 for Andrews County, and \$30,432 for Gaines County—well below their respective State averages.

Table 3-15 Employment and Income in the Region of Influence

Subject	Lea County, New Mexico	Andrews County, Texas	Gaines County, Texas	Region of Influence	New Mexico Total	Texas Total
<i>Employment (Year 2000)</i>						
In-Labor Force	22,286	5,511	5,776	33,573	823,440	9,830,559
Employed	20,254	5,064	5,460	30,778	763,116	9,234,372
Unemployed	2,032	447	316	2,795	60,324	596,187
Unemployment Rate	9.1%	8.1%	5.5%	8.3%	7.3%	6.1%
Industry	Share of Total Employment					
Agriculture, Forestry, Fishing, and Mining	20.7%	21.0%	25.0%	21.5%	4.0%	2.7%
Construction	6.3%	5.1%	7.3%	6.2%	7.9%	8.1%
Manufacturing	3.5%	8.6%	5.3%	4.7%	6.5%	11.8%
Trade (wholesale and retail)	15.2%	13.9%	14.5%	14.8%	14.9%	15.9%
Transportation and Utilities	6.7%	4.1%	7.4%	6.4%	4.7%	5.8%
Information	1.1%	1.8%	1.3%	1.3%	2.4%	3.1%
Finance, Insurance, and Real Estate	3.2%	3.5%	3.7%	3.3%	5.5%	6.8%
Professional, Scientific, Management, Administration, and Waste Management	4.5%	4.6%	1.5%	4.0%	9.4%	9.5%
Educational, Health, and Social Services	20.6%	24.6%	20.2%	21.2%	21.7%	19.3%
Arts, Entertainment, Recreation, etc.	6.6%	5.2%	4.7%	6.0%	9.8%	7.3%
Other Services	6.6%	4.5%	6.6%	6.3%	5.1%	5.2%
Public Administration	5.1%	3.2%	2.7%	4.4%	8.0%	4.5%
Income						
Median Household Income (\$)	29,799	34,036	30,432	30,572	34,133	39,927
Per Capita Income (\$)	14,184	15,916	13,088	14,264	17,261	19,617

Source: USCB, 2002a; USCB, 2002b.

3.10.3 Community Services, Infrastructure, and Finances

There are four schools located within an 8-kilometer (5-mile) radius of the proposed NEF site. These include an elementary school, a middle school, a high school, and a private K-12 school. The school system in Hobbs, New Mexico, includes a special education facility, 12 elementary schools, 3 junior high schools, and a high school that serves grades 10 through 12. There are also two private schools, a community vocational college (New Mexico Junior College), and a four-year college (College of the Southwest). The closest schools in Texas are located about 50 kilometers (32 miles) away from the proposed site.

The nearest hospital to the site is the Lea Regional Medical Center. It is located about 32 kilometers (20 miles) north of the proposed NEF site in Hobbs. It has 250 beds and handles both acute and stable chronic-care patients. Nursing or retirement homes are also located in Hobbs. The next closest hospital, Nor-Lea Hospital, is located in Lovington, about 64 kilometers (39 miles) north-northwest of the proposed NEF. It is a full-service hospital with 27 beds. The Eunice health clinic (Prime Care) is the closest medical clinic to the proposed NEF.

Public safety within the vicinity of the site includes fire support provided by the Eunice Fire and Rescue Service (with a full-time Fire Chief and 34 volunteers) and the Eunice Police Department (with 5 full-time officers). Mutual-aid agreements also exist with all of the county fire and police departments. If additional fire or police services are required, nearby counties can provide additional response services. In particular, members of the proposed NEF Emergency Response Organization can provide information and assistance in instances where radioactive/hazardous materials are involved. Table 3-16 describes the available fire and rescue equipment.

The main highway in the county is U.S. Highway 62-180, which runs east-west through Hobbs. It is designated as a primary feeder to the interstate highway system. The community of Eunice lies near the junction of New Mexico Highways 207 and 234. New Mexico Highways 234 (east-west) and 18 (north-south) are the major transportation routes near the proposed NEF site and intersect about 6.4 kilometers (4 miles) west. The nearest residences are located along the west side of New Mexico Highway 18, just south of its intersection with New Mexico Highway 234.

An active railroad line operated by the Texas-New Mexico Railroad runs parallel to New Mexico Highway 18 and is located just east of Eunice. There is also an active private railroad spur line that runs from the Texas-New Mexico Railroad along the north boundary of the proposed NEF site and terminates at the WCS facility just across the New Mexico-Texas border. Section 3.13.2 of this Chapter provides additional information on this railroad.

The nearest airport is about 16 kilometers (10 miles) west from the site. It is maintained by Lea County and is used primarily by privately owned planes. The airport has two runways that are 1,000 meters (3,280 feet) and 780 meters (2,550 feet) in length. There is neither a control tower nor commercial air carrier flights at this airport. Lea County Regional Airport is the nearest commercial carrier airport located 32 kilometers (20 miles) north in Hobbs, New Mexico (LES, 2004a). Section 3.13.3 of this Chapter provides additional information on the airports within the region of influence.

Table 3-16 Eunice Fire and Rescue Equipment in the Vicinity of the Proposed NEF Site

Type of Equipment	Quantity	Description
Ambulance	3	None
Pumper Fire Trucks	3	340 m ³ /hr (1,500 gpm) pump; 3,785 L (1,000 gal) water capacity 227 m ³ /hr (1,000 gpm) pump; 1,893 L (500 gal) water capacity 284 m ³ /hr (1,250 gpm) pump; 2,839 L (750 gal) water capacity
Water Truck	1	114 m ³ /hr (500 gpm) pump; 22,700 L (6,000 gal) water capacity
Grass Fire Truck	3	68 m ³ /hr (300 gpm) pump; 3,785 L (1,000 gal) water capacity 34 m ³ /hr (150 gpm) pump; 1,136 L (300 gal) water capacity 34 m ³ /hr (150 gpm) pump; 946 L (250 gal) water capacity
Rescue Truck	1	45 m ³ /hr (200 gpm) pump; 379 L (100 gal) water capacity

m³/hr - cubic meters per hour.

gpm - gallons per minutes.

L - liters; gal - gallons.

Source: LES, 2004a.

3.10.4 Utilities

3.10.4.1 Electric Power Services

Southwestern Public Service Company, now operating as Xcel Energy, provides electricity to the area surrounding the proposed NEF (EDCLC, 2004). The electrical power for the proposed NEF would be derived by means of two synchronized 115-kilovolt overhead transmission lines from a substation east of the site. The Xcel Energy service territory encompasses about 134,700 square kilometers (52,000 square miles). Large commercial and industrial users are provided service under contract. There is a demand charge of \$1,654 for the first 200 kilowatts that increases by \$7.76 for each additional kilowatt. Energy rates are \$0.02505 per kilowatt-hour for the first 230 kilowatt-hour per month-kilowatt or the first 120,000 kilowatts. Energy rates decline slightly for additional usage. Power-factor adjustments may apply to large users, and fuel-cost adjustments may be imposed on all customers.

3.10.4.2 Natural Gas Services

The Public Service Company of New Mexico provides natural gas services to the Eunice area (EDCLC, 2004). As with electricity service, natural gas is relatively inexpensive. The average cost of gas is about \$2.51 per thousand cubic feet for all customer classes and is significantly below national averages.

3.10.4.3 Domestic Water Supply

Lea County municipal water comes from wells that tap the Ogallala Aquifer (EDCLC, 2004). In Eunice, water is pumped from a well field located near Hobbs and transported south in two parallel cross-country mains (LCWUA, 2003). The pumping depth is about 15 meters (50 feet). The water quality is good, and disinfection is the only treatment performed prior to delivery. Currently, Eunice is pumping about 2.04

million cubic meters (1654 acre-feet) annually with a difference between base winter demand and summer peak demand of nearly 240 percent (EDCLC, 2004).

3.10.4.4 Waste Disposal

In Eunice and Hobbs, solid-waste-disposal pickup is contracted to Waste Management, Inc. Pickups are offered once or twice a week. Solid wastes are disposed of in the Lea County landfill located about 8 kilometers (5 miles) east of Eunice just across from the proposed NEF site. The landfill accepts all types of residential, commercial, special wastes, and sludges (EDCLC, 2004).

3.10.5 Tax Structure and Distribution

Property taxes in New Mexico are among the lowest in the United States. Four governmental entities within New Mexico are authorized to tax—the State, counties, municipalities, and school districts. Property assessment rates are 33-1/3 percent of value. The tax applied is a composite of State, county, municipal, and school district levies. The Lea County tax rate for nonresidential property outside the city limits of Eunice is \$18.126 per \$1,000 of net taxable value of a property. Rates for nonresidential property are slightly higher within the city limits of Eunice. Residential property tax rates are somewhat lower for properties within and outside Eunice. For Hobbs, tax rates are somewhat higher.

New Mexico also imposes a gross receipts tax on producers and businesses. This tax is mostly passed onto the consumer. The State gross receipts tax rate is 5.00 percent, and local communities may also impose an additional 1.9375 percent.

In Texas, property taxes are based on the most current year's market value. Andrews County, Texas, has a county property tax rate (per \$100 assessed value) of \$0.539 per \$100 assessment, a school district tax of \$1.717 per \$100 assessed value, and a municipal rate for the city of Andrews of \$0.305 per \$100 assessed value. The county tax rate for Gaines is \$0.381, with municipal and school district rates for Seminole of \$0.60 and \$0.98, respectively. There is also a State sales tax of 6.25 percent and municipal sales tax of 1 percent.

3.11 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629), directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. In December 1997, the Council on Environmental Quality released its guidance on environmental justice under NEPA (CEQ, 1997). Although an independent organization, NRC has committed to undertake environmental justice reviews. The NRC Nuclear Material Safety and Safeguards (NMSS) environmental justice guidance is found in Appendix C to NUREG-1748 (NRC, 2003a).

This environmental justice review analyzes whether the proposed NEF has the potential for an environmental justice concern for low-income and minority populations resulting from the proposed action and its alternatives. The NRC staff analyzed demographic data to identify the minority and low-income groups within the area of environmental study. Next, the impacts from the proposed action and its alternatives were evaluated to determine if the impacts disproportionately affected minority and low-income groups in an adverse manner.

For the purpose of this procedure, minority is defined as individual(s) who are members of the following population groups: American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; African American (not of Hispanic or Latino origin); some other race; and Hispanic or Latino (of any race). In the States of New Mexico and Texas, it is likely that “some other race” mainly includes individuals who identified themselves on the 2000 Census in a Latino or Hispanic group under “race” (e.g., Mexican or Puerto Rican), even though Hispanic/Latino is not a Census racial category. The 2000 Census introduced the multiracial category. Anyone who identifies themselves as white and a minority is counted as that minority group. In the small number of cases where individuals identify themselves as more than one minority, the analysis counts that individual in a “Two or More Races” group.

To determine if environmental justice will have to be considered in greater detail, the NRC staff compares the percentage of minority and low-income populations in Census block groups in the area for assessment to the State and county percentages. If the minority or low-income population percentage in a block group exceeds 50 percent or is significantly greater than the State or county percentage, environmental justice will have to be considered in greater detail. Generally (and where appropriate), the NRC staff may consider differences greater than 20 percentage points to be significant. When determining the area for impact assessment for a facility located outside the city limits or in a rural area, a 6.4-kilometer (4-mile) radius (or 130-square kilometer [50-square mile]) could be used. A larger area should be considered if the potential impact area is larger. The staff also supplements the demographic analysis with scoping to identify low-income and minority populations (NRC, 2003a).

In the current situation, the States of New Mexico and Texas have very high percentages of minority populations, and rural areas in the State tend to have sparsely-populated large block groups (a block group is a cluster of census blocks that are normally comprised of up to several hundred people). As a result of the nature of the proposed action being examined and the local circumstances, the area for impact assessment was expanded to an 80-kilometer (50-mile) radius and includes an assessment along transportation routes. It is important to note that the expanded radius does not dilute the environmental justice impact of the proposed NEF because no averaging of environmental effects takes place; instead, each minority community is evaluated on its own. The criteria for identifying minority and low-income communities are not diluted by the wider radius because the demographic and income characteristics of each block group are individually compared against the States of New Mexico and Texas and the relevant counties. Rather, it simply expands the geographic area where additional minority and low-income block groups can be (and were) identified.

Usually, under NRC guidance, a minority population with environmental justice potential would be one with a minority percentage of at least 50 percent or at least 20 percentage points greater than the State and relevant counties. However, the State of New Mexico has a high Statewide minority population. Table 3-17 shows the Hispanic/Latino population in New Mexico is 42.1 percent and the total minority population is 55.3 percent, while the corresponding national percentages are 12.5 percent and 30.9 percent. A similar situation occurs in Texas, with an Hispanic/Latino population of 32.0 percent and a total minority population of 47.6 percent. Therefore, in both States, a census block group within the impact assessment area with a Hispanic/Latino population of at least 50 percent or with a minority population of at least 50 percent ordinarily would count as a minority population worthy of further study.

Table 3-17 Percentage of Minority and Low-Income Census Block Groups Within 80 Kilometers (50 Miles) of the Proposed NEF Site

	Total Census Block Groups in County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Block Groups
State of New Mexico (%)	--	18.4	2.1	10.2	1.4	19.0	0.6	42.1	55.3	--
Threshold for EJ Concerns (%)	--	38.4	22.1	30.2	21.4	39.0	20.6	50.0/42.1	50.0	--
<i>Number of Block Groups Meeting Environmental Justice Criteria</i>										
Eddy County	3	0	0	0	0	0	0	1	1	1
Lea County	63	8	1	0	0	15	0	28	29	31
New Mexico Counties	66	8	1	0	0	15	0	29	30	32
State of Texas (%)	--	15.4	11.7	0.9	3.0	13.0	0.4	32.0	47.6	--
Threshold for EJ Concerns (%)	--	35.4	31.7	20.9	23.0	33.0	20.4	50.0/32.0	50.0	--
Andrews County	15	0	0	0	0	1	0	11	6	11
Ector County	5	0	0	0	0	0	0	3	1	3
Gaines County	13	0	0	0	0	1	0	10	4	10
Loving County	1	0	0	0	0	0	0	0	0	0
Terry County	1	0	0	0	0	0	0	1	0	1
Winkler County	10	1	0	0	0	1	0	9	3	9
Yoakum County	6	0	0	0	0	1	0	6	2	6
Texas Counties	51	1	0	0	0	4	0	40	16	40
Grand Total	117	9	1	0	0	19	0	69	46	72

Source: USCB, 2002a; USCB, 2002b.

In view of the resulting anomalously high standard for designating minority populations in New Mexico and to better meet the spirit of the NRC guidance to identify minority and low-income populations, the NRC staff included Census block groups with a percentage of Hispanics and Latinos at least as great as the Statewide average. This more inclusive definition adds two additional minority block groups in Lea County and four in Andrews County. Each block group was compared to the corresponding State and county percentages for each individual racial category and the Hispanic/Latino category and for the sum of all minority categories taken together (all racial minorities, plus white Hispanic/Latinos) using the percentage criteria. Although New Mexico and Texas are both within the top 10 States for percentage of low-income individuals (with percentages of 18.4 and 15.4 percent, respectively) for the 80-kilometer (50-mile) region surrounding the proposed NEF, the percentage of low-income persons in almost all of the block groups is within 20 percentage points of the national average of 12.4 percent. The usual “50 percent or 20 percent greater than” standard based on the Statewide percentage appears adequate to identify the concentrations of low-income population.

In some cases, minority and low-income groups may rely on environmental resources for their subsistence and to support unique cultural practices. Therefore, NRC guidance specifies that the NRC staff review special resource uses or dependencies of identified minority and low-income populations including cultural practices and customs, previous environmental impacts, and features of previous and current health and economic status of the identified groups. In some circumstances, these groups could be unusually vulnerable to impacts from the proposed action.

Potential resource dependencies were sought in the course of public meetings and other information supplied by the Hispanic/Latino and African American/Black communities in meetings with the NRC staff. Letters were also sent to local Federally recognized Indian tribes to determine any potential resource dependencies. These letters described the construction and operation of the proposed NEF, solicited their concerns on the project, and inquired about whether the Indian tribes desired to participate in the Section 106 consultation process (see Appendix B). The Kiowa Tribe of Oklahoma, Comanche Tribe of Oklahoma, and Ysleta del Sur Pueblo and Mescalero Apache Tribe have indicated that there are no historic properties in the area of potential effects that could have cultural or religious significance to them. Currently, very few Indians live in the area. The NRC staff examined data provided by the States of New Mexico and Texas concerning the health status of the minority and low-income populations in Lea and Eddy Counties in New Mexico and Andrews County in Texas. The results are described in Section 4.2.9 of this Draft EIS.

The NRC staff examined the geographic distribution of minority and low-income populations within 80 kilometers (50 miles) of the proposed NEF site (see Appendix G). This data was based on 2000 U.S. Census information and supplemented by field inquiries by the NRC staff to the local planning departments in Lea, Eddy, and Andrews counties and to social service agencies in the two States. In addition, public comments during the scoping process were reviewed to see if any additional environmental justice populations could be identified.

3.11.1 Minority Populations

The significant minority populations near the proposed NEF are Hispanics/Latinos. Lea County had a 2000 Census population of 22,010 persons of Hispanic/Latino ethnicity out of a total resident population of 55,511 (39.6 percent). Figure 3-30 illustrates the minority population census block groups within 80 kilometers (50 miles) of the proposed NEF and shows the locations of the block groups that meet the minority criteria. Table 3-17 shows the number of minority populations and low-income census block groups within 80 kilometers (50 miles) that satisfy each criterion used for this analysis. Taken together,

the criteria resulted in 72 minority block groups out of 117 total block groups within 80 kilometers (50 miles) of the NEF. Of these, 69 were identified using the total minority criterion, and an additional 3 were identified from 1 of the individual minority categories. Many of the minority block groups satisfied one or more individual minority group criteria in addition to the total minority criterion.

The minority and low-income percentages for each census block group within 80 kilometers (50 miles) of the proposed NEF are tabulated in Appendix G. In the table, the census block groups exceeding the 50 percent/20-percentage-point criterion are in boldface, while additional block groups with Hispanic/Latino populations at least as great as the Statewide percentage are shown in italics.

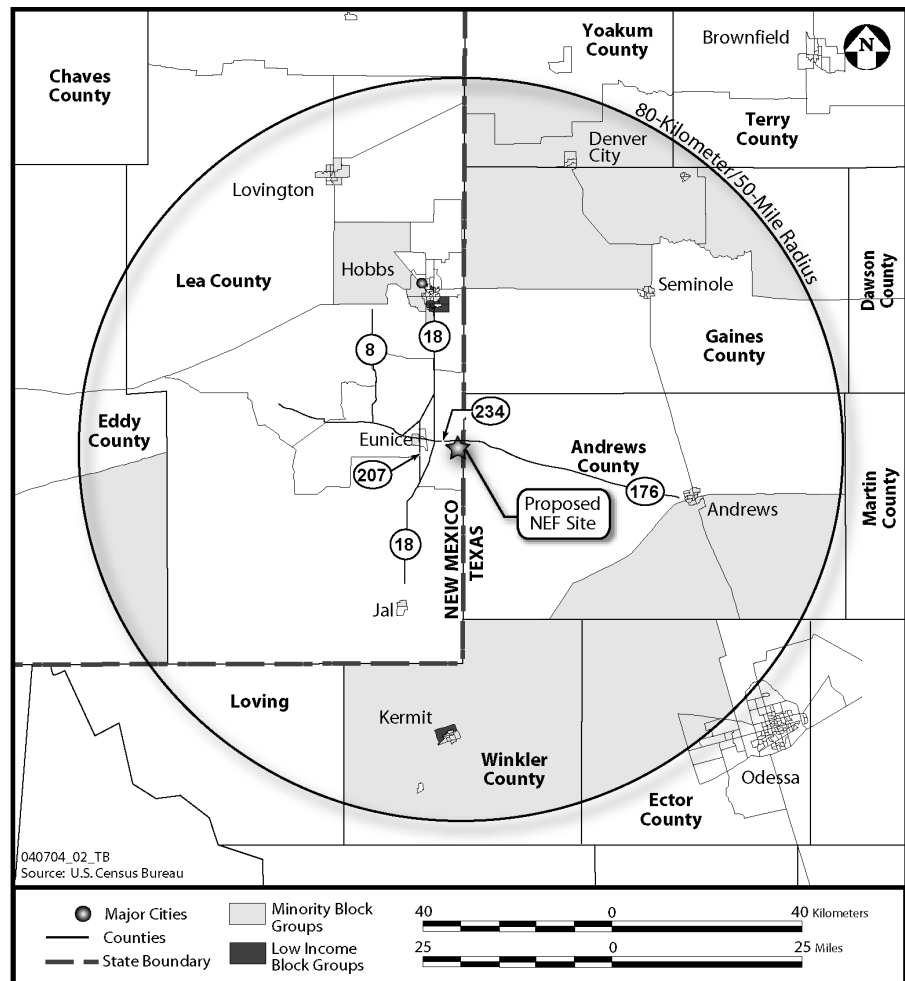


Figure 3-30 Geographic Distribution of Minority and Low-Income Census Block Groups Within an 80-kilometer (50-mile) Radius of the Proposed NEF Site (USCB, 2003)

It should be noted that for this analysis, the State was used as the area of geographic comparison. That is, the minority and low-income populations were based on a comparison to the State averages. Using county averages instead made no difference in the minority and low-income block groups identified. There is a small African American/Black population in Lea County. One block group in Lea County has an elevated African American/Black population, but would have qualified as a minority block group because it has a Hispanic/Latino majority.

Hispanics/Latinos are Lea County's principal minority group with 22,010 individuals. There is a significant Hispanic community in all towns in the county. Also, there are concentrations of Hispanics in all seven Texas counties within 80 kilometers (50 miles) of the proposed NEF site. There are Hispanic/Latino block groups along all of the principal commuting and construction access routes to the proposed NEF site. The African American/Black community on the south side of Hobbs also lies close to one of these routes. No other significant minority populations were identified in any census block group either close to the proposed NEF site or along the proposed transportation corridors into the site.

In summary, 72 census block groups within 80 kilometers (50 miles) of the proposed NEF site were identified as satisfying the criteria used in this analysis to consider environmental justice in greater detail based on their minority population. The minority population nearest to the proposed site is the Hispanic/Latino population living on the west side of Eunice. Minority block groups also are located along the likeliest commuting and construction access routes. As a result, an extra effort was made to meet with representatives of the African-American and Hispanic/Latino groups in particular to determine if a disproportionately high and adverse impact might occur from construction and operation of the proposed NEF.

3.11.2 Low-Income Populations

Figure 3-30 also shows the location of low-income populations for the environmental study area out to 80 kilometers (50 miles) from the proposed NEF site. Table 3-17 shows that a total of 9 block groups exceed the 20-percentage-point criterion. However, many other block groups in the area also have relatively high percentages of people living below the poverty line. Appendix G shows detailed information on individual block groups within 80 kilometers (50 miles) that satisfy the criteria used for this analysis. The nearest block groups meeting the NRC low-income criteria are on the south side of Hobbs. About 19,000 (20 percent) of the 96,300 people estimated to be living within 80 kilometers (50 miles) of the proposed site are low income. The main low-income areas within 80 kilometers (50 miles) of the proposed NEF are located, as shown in Figure 3-30, within a mile or two of the principal commuting and construction access routes.

3.11.3 Resource Dependencies and Vulnerabilities of the Minority/Low-Income Population

While people in the area of the proposed NEF site do depend on ground water supplied from personal wells or public water utilities, inquiries to the minority and low-income community did not show any exceptional or disproportionate dependence on natural resources that might be affected by the proposed NEF.

Information from the New Mexico and Texas State Departments of Health was examined to see whether there were any exceptional patterns of diminished health status among residents of the area surrounding the proposed NEF site. In particular, this search was seeking any exceptional vulnerabilities among minority and low-income residents of the area. Tables 3-18 and 3-19, which summarize this information, show local populations that have lower cancer incidence than the Statewide averages and higher local crude (total, not age-adjusted) death rates from four other major groups of diseases (possibly due to differences in the age structure of the population in Lea and Andrews counties) (NMDH, 2003a; TDH, 2004; TDH, 2003). No unusual incidence of disease in the minority and low-income population was found in either county. Statewide data on crude death rates for both States do not show any unusual health vulnerabilities among minority populations (separate data on low-income residents were not available). Low crude death rates for Hispanics/Latinos in Texas appear to be the result of an exceptionally young Hispanics/Latino population in that State because age-specific death rates are more in line with those of the majority population (NMDH, 2003b; TDH, 2003).

Interviews with members of the minority community during the scoping process did not turn up any additional minority or low-income populations not identified by the mapping shown in Figure 3-30. Although there were no specific environmental health concerns among minority and low-income populations mentioned in these interviews, two types of pre-existing health conditions were mentioned. One was a high rate of heart disease among African American/Blacks in Lea County, which was believed to be diet-related. The other was a high national rate of diabetes incidence among Hispanics that could

also be true of the Lea County area, although this could not be documented. The Statewide statistics for New Mexico and Texas shown in Table 3-19 tend to confirm possible high diabetes incidence, with elevated rates of death from diabetes in New Mexico and Texas among minority populations. Heart disease death rates in Table 3-18 are higher locally in Lea and Andrews counties than Statewide in New Mexico and Texas, although Statewide death rates among minority populations in Table 3-19 are lower than among non-Hispanic whites.

It was not possible to obtain comparative death rates or disease incidence rates for local ethnic groups. There were no other potential vulnerabilities identified for minority and low-income populations other than their geographic proximity to the proposed NEF site and potential transportation routes. The proximity of these populations means that there is a potential for environmental justice concerns. Section 4.2.9 evaluates the potential impact of construction and operation of the proposed NEF to determine whether there are likely to be any disproportionately high and adverse effects on the minority and low-income populations in the area.

Table 3-18 Selected Health Statistics for Counties Near the Proposed NEF Site

	Lea County	New Mexico	Andrews County	Texas
<i>Cancer Incidence (Rate per 100,000 population)</i>				
Male	456.5	468.7	496.4	537.9
Female	318.3	353.8	333.8	384.3
<i>Age-Adjusted Cancer Deaths (Rate per 100,000 population)</i>				
Male	251.9	210.8	238.0	260.8
Female	167.9	146.2	135.1	164.3
<i>Leading Causes of Death 1996-2000 (Rate per 100,000 population)</i>				
Diseases of Heart	231.2	184.6	286.4	218.8
Malignant Neoplasms	179.7	161.4	281.4	165.3
Cerebrovascular Diseases	61.1	46.4	72.6	51.8
Chronic Lower Respiratory Diseases	50.1	45.4	54.4	35.0

Source: NMDH, 2003a; NMDH, 2004; TDH, 2004; TDH, 2003.

Table 3-19 Incidence of Selected Causes of Death Among New Mexico and Texas Populations

	Annual Death Rates			
	White Non-Hispanics	White Hispanics	Native Americans	African American / Black
New Mexico	(No. Per 1,000, 1998-2002)			
Infant Mortality, All Causes	6.4	6.8	7.5	11.1
	(No. Per 100,000, 1998-2000)			
Diabetes Death	20.5	45.1	83.9	N/A
Influenza/ Pneumonia Death	20.0	21.6	41.7	N/A
Cancer Death	184.8	174.1	138.5	N/A
Heart Disease Death	221.6	194.4	185.6	N/A
Texas	(No. Per 1,000, 1998-2000)			
Infant Mortality All Causes	5.4	6.2	NA	11.3
	(No. Per 100,000, 1998-2000)			
Diabetes Death	22.9	25.4	NA	34.5
Influenza/ Pneumonia Death	27.0	9.1	NA	17.0
Cancer Death	207.6	73.8	NA	180.5
Heart Disease Death	275.3	93.1	NA	233.4

Source: NMDH, 2003b; TDH, 2003.

3.12 Noise

The proposed NEF site is located in an unpopulated area of southeastern New Mexico that is used primarily for intermittent cattle grazing. The nearest commercial noise receptors are five businesses located between a 0.8-kilometer (0.5-mile) and 2.6-kilometer (1.6-mile) radius of the proposed site. These five businesses are WCS, located due east of the site over the Texas border; Lea County Landfill, located to the southeast; Sundance Services, Inc., and Wallach Concrete, Inc., located to the north; and DD Landfarm, located just west of the site. The nearest residential noise receptors are homes located approximately 4.3 kilometers (2.6 miles) to the east near the city of Eunice, New Mexico.

LES conducted a background noise-level survey at the four corners of the site boundary on September 16-18, 2003 (LES, 2004a). The measured background noise levels at the site boundaries, which ranged between 40.1 and 50.4 decibels A-weighted, represent the nearest receptor locations for the general public. These locations are anticipated to receive the highest noise levels during construction and when the plant is operational. Noise intensity can be affected by many factors including weather conditions, foliage density, temperature, and land contours.

There are no city, county, or New Mexico State ordinances and regulations governing noise. There are no affected Indian tribes within the sensitive receptor distances from the site; therefore, the proposed NEF site is not subject to Federal, State, tribal, or local noise regulations. The U.S. Department of

Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) have standards for community noise levels. HUD has developed land use compatibility guidelines (HUD, 2002) for acceptable noise versus the specific land use. Table 3-20 shows these guidelines. The EPA has defined a goal of 55 decibels A-weighted for day-night sound level in outdoor spaces (EPA, 2002b). The background noise levels measured for the proposed NEF site are below both criteria for a daytime period.

Table 3-20 HUD Land Use Compatibility Guidelines for Noise

Land Use Category	Sound Pressure Level (dBA L _{dn})			
	Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential	<60	60-65	65-75	>75
Livestock Farming	<60	60-75	75-80	>80
Office Buildings	<65	65-75	75-80	>80
Wholesale, Industrial, Manufacturing & Utilities	<70	70-80	80-85	>85

dBa = decibels A-weighted.

L_{dn} = day-night sound level.

Source: HUD, 2002.

3.13 Transportation

3.13.1 Local Roads and Highways

The proposed NEF site is on land currently owned by the State of New Mexico. An onsite, gravel-surfaced road bisects the site in an east-west direction. New Mexico Highway 234 is located along the south side of the site and provides direct access to the site. New Mexico Highway 234 is a two-lane highway with 3.7-meter (12-foot) driving lanes, 2.4-meter (8-foot) shoulders, and a 61-meter (200-foot) right-of-way easement on either side. According to the New Mexico Department of Transportation, there are no plans to upgrade New Mexico Highway 234. Maintenance activities on New Mexico Highway 234 to perform maintenance on the road and shoulders are planned, but it is not known when this will occur (NMDOT, 2004a).

To the north of the site, U.S. Highway 62/180 intersects New Mexico Highway 18 and provides access from the city of Hobbs to New Mexico Highway 234. New Mexico Highway 18 is a four-lane divided highway that was rehabilitated within the last four to six years. To the east of the proposed site, U.S. Highway 385 intersects Texas Highway 176 and provides access from the town of Andrews, Texas, to New Mexico Highway 234. To the south of the proposed site and in the State of Texas, Interstate 20 intersects Texas Highway 18 in Texas, which becomes New Mexico Highway 18 when it enters the State of New Mexico. To the west, New Mexico Highway 8 provides access from the city of Eunice east to New Mexico Highway 234. Table 3-21 lists current traffic volume for the road systems in the vicinity of the proposed NEF site.

The State of New Mexico and the State of Texas have indicated that there are no known restrictions on the types of materials that may be transported along the important transportation corridors (NMDOT, 2004a; TDOT, 2004).

Table 3-21 Current Traffic Volume for the Road Systems In the Vicinity of the Proposed NEF Site

Road Name	Traffic Volume Per Day
New Mexico Highway 234 (between New Mexico Highway 18 and Texas border)	1,823
New Mexico Highway 18 (South of New Mexico Highway 234)	5,446
New Mexico Highway 18 (North of New Mexico Highway 207)	5,531
New Mexico Highway 18 (between New Mexico Highway 234 and New Mexico Highway 207)	5,446
Texas Highway 176 (near New Mexico/Texas border)	1,750

Source: NMDOT, 2004b.

3.13.2 Railroads

The Texas-New Mexico Railroad operates an active rail transportation line in Eunice, New Mexico, approximately 5.8 kilometers (3.6 miles) west of the proposed site. The rail line is predominately used for freight transport by the local oil and gas industry. Trains travel on this rail line at an average rate of one train per day. An active rail spur is located along the northern property line of the proposed site. The rail spur is owned by WCS, owner of the neighboring property to the east. Trains travel on this rail spur at an average rate of one train per week. The trains that travel on the spur typically consist of five to six cars. The rail spur has a speed limit of 16 kilometers (10 miles) per hour.

3.13.3 Other Transportation

The nearest commercial airport is the Lea County Regional Airport, located 32 kilometers (20 miles) north of the proposed NEF site near Hobbs, New Mexico. The nearest airport is located approximately 16 kilometers (10 miles) west of the site near Eunice. The airport is used by privately owned planes and has no control tower. The airport has two runways that are 1,000 meters (3,280 feet) and 780 meters (2,550 feet) in length.

Two major international airports are located within approximately 161 kilometers (100 miles) of the proposed NEF site. The nearest is the Midland International Airport (also known as the Midland/Odessa Airport). This four-runway airport is located in Texas about 103 kilometers (64 miles) southeast of the proposed site and is owned and operated by the city of Midland. The Midland/Odessa Airport is designated Foreign Trade Zone #165 (a Foreign-Trade Zone is a Federal program that designates an area within the United States that is considered outside of the U.S. Customs territory where certain types of merchandise can be imported without going through formal Customs entry procedures or paying import duties [FTZ, 2004]). The Grantee is the city of Midland (MIA, 2004). Lubbock International Airport, located along Interstate 27 in Texas (approximately 160 kilometers [100 miles] northeast of Eunice), can also serve the site. The Lubbock International Airport is a 3-runway airport and runs about 60 inbound and outbound flights daily (LIA, 2004).

3.14 Public and Occupational Health

This section describes the naturally occurring sources of radiation and chemicals and the levels of exposure that may be found at the proposed NEF site.

3.14.1 Background Radiological Exposure

Humans are exposed to ionizing radiation from many sources in the environment. Radioactivity from naturally occurring elements in the environment is present in soil, rocks, and in living organisms. A major proportion of natural background radiation comes from naturally occurring airborne sources such as radon. These natural radiation sources contribute approximately 3 millisieverts (300 millirem) per year to the radiation dose that everyone receives annually.

Manmade sources also contribute to the average amount of dose a member of the U.S. population receives. These sources include x rays for medical purposes (0.53 millisieverts [53 millirem] per year) and consumer products (0.1 millisieverts [10 mrem] per year) (e.g., smoke detectors). A person living in the United States receives an average dose of about 3.6 millisieverts (360 mrem) per year (NCRP, 1987). Figure 3-31 depicts the major sources and levels of background radiation near the proposed NEF site.

The U.S. Department of Energy (DOE) established radiological monitoring programs in southeastern New Mexico prior to the Waste Isolation Pilot Plant project to determine the widespread impacts of nuclear testing at the Nevada Test Site on the background radiation. DOE estimated the annual dose of approximately 0.65 millisieverts (65 millirem) is received from atmospheric particulate matter, ambient radiation, soil, surface water and sediment, ground water, and biota (DOE, 1997). These values fall within expected ranges and do not indicate any unexpected environmental concentrations. Lea County lies in an area that is characterized by radon concentrations of 2 to 4 picocuries per liter and is defined as of moderate radon potential (EPA, 2004b). In May 2004, direct background radiation was measured to be 8 to 10 microRad per hour (LES, 2004a), which corresponds to 0.70 to 0.88 milliSieverts (70 to 88 mrem) per year. The measured range falls within the average annual direct background radiation for the United States shown in Figure 3-31.

3.14.2 Background Chemical Characteristics

Eight soil samples taken at the proposed NEF site indicated only barium, chromium, and lead were detected above laboratory reporting limits. The concentrations of these elements in the soil were 23, 3.6, and 2.7 milligrams per kilogram, respectively (LES, 2004a). These concentrations are below health limits (NMEDHWB, 2004). Other nonradiological parameters were below the laboratory reporting limits.

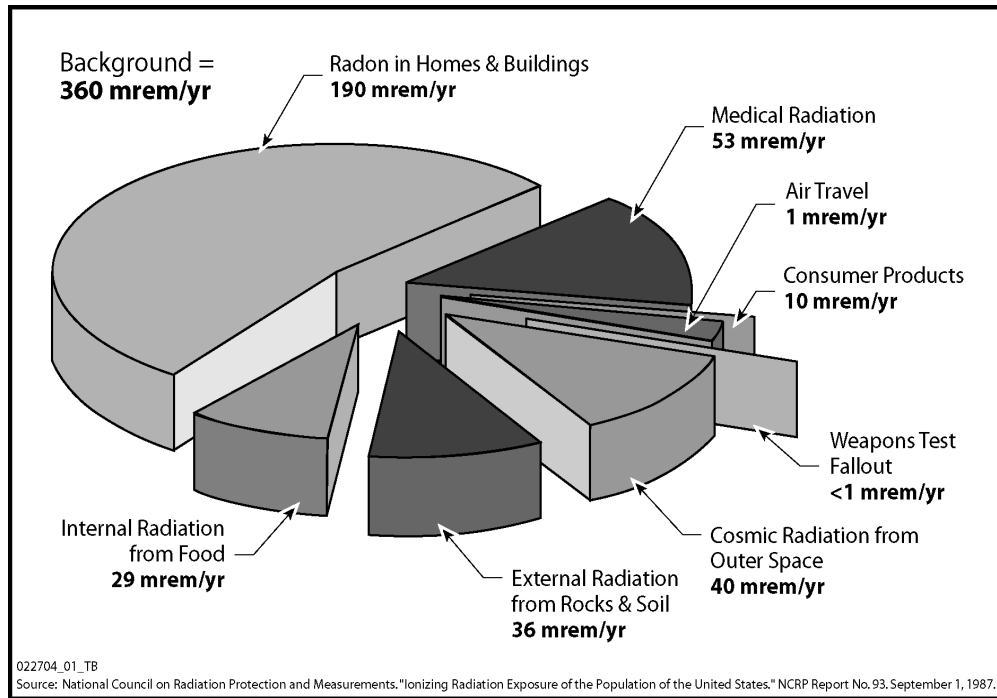


Figure 3-31 Major Sources and Levels of Background Radiation Exposure in the Proposed NEF Vicinity (NCRP, 1987)

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